

SON PREFERENCE AND FERTILITY IN CHINA, SOUTH KOREA,
AND THE UNITED STATES

A Dissertation

by

HO SIK MIN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2007

Major Subject: Sociology

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Approved by:

Chair of Committee,
Committee Members,

Head of Department,

Dudley L. Poston Jr.
Rogelio Saenz
Barbara Finlay
Don E. Albrecht
Mark Fossett

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ABSTRACT

Son Preference and Fertility in China, South Korea,
and the United States. (May 2007)

Ho Sik Min, B.A., Korea University;
M.A., Korea University

Chair of Advisory Committee: Dr. Dudley L. Poston Jr.

The goal of this dissertation is to contribute in three ways to the literature on son preference and fertility through a comparative perspective. First, I examine the impact of son preference on fertility in China and South Korea compared with the United States. The impact that a female birth has on the likelihood of a woman having another birth is of the most concern: Women who have one or two daughter(s) as previous child(ren) are expected to be more likely to experience the hazard of having a second or a third birth. Second, my dissertation attempts to examine the effects of women's status on son preference if women's education reduces son preference. Third, my dissertation examines son preference and fertility in the U.S. Even though the U.S. has never shown son preference regarding sex ratios at birth, recent research has shown this association to exist among poor Hispanics. My dissertation used data from a national sample, 2002 National Survey of Family Growth.

The results showed that women in China and South Korea who had a daughter instead of a son as their first child had a higher hazard of having a second birth as expected. Moreover, the results showed that the hazard ratio of having a third birth for Chinese and South Korean women was almost four and five times more, respectively. As expected, the hazard ratios for the U.S. were not significant and thus did not support the hypothesis. And the more educated women who had a daughter(s) instead of a son(s) as their previous child(ren) were less likely to have a second birth, but not in the third birth. This means women's education apparently does not reduce son preference in the case of the third birth. Thus, women's education apparently has limited or no influence on the childbearing decision where son preference is strong. Third, Hispanic women with low socioeconomic status did not have a significant hazard ratio of having a higher order birth. Accordingly, the dissertation does not find any statistical evidence of American son preference at the national level.

ACKNOWLEDGMENTS

I am deeply grateful to the dissertation committee, Dr. Dudley L. Poston, Dr. Rogelio Saenz, Dr. Barbara Finlay, and Dr. Don Albrecht. Their important comments and suggestions improved this dissertation during its development.

I especially owe a great debt of gratitude to my mentor, Dr. Dudley L. Poston. Without his guidance and encouragement, this study would not have been accomplished. I would like to thank Dr. Poston for leading me to the area of demography, and for his enormous patience and valuable comments, chapter by chapter, on this manuscript.

In addition, I want to thank my colleagues, Dr. Mary Ann Davis and D'Lane Compton, for spending their precious time on this manuscript. Their comments are greatly appreciated.

Last but not least, I want to thank my dear wife, Hyeong Kyeong Kook and lovely son, Eugene, for tolerating my absence and late hours at work. My wife's emotional and moral support and assistance especially are deeply appreciated. This dissertation is as much theirs as it is mine.

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CHAPTER I

INTRODUCTION

There has been a lot of attention in recent years given to the study of imbalanced Sex Ratios at Birth (SRB), which are mainly caused by son preference (Guttentag & Secord 1983; Hull 1990; Zeng et al. 1993; Park and Cho 1995; Poston 2002a). This attention is due in part to the fact that imbalanced SRBs could result in future problems, such as lack of brides. While many demographers have tended to describe the imbalanced SRBs and its reasons, not many empirical studies have used the sex of prior child to estimate the likelihood of having another child.

Imbalanced SRBs have been observed since the 1980s in mostly Asian countries such as China, India, Taiwan, South Korea, and others (Guttentag and Secord 1983; Hull 1990; Bumiller 1985; Zeng et al. 1993; Park and Cho 1995; and Poston 2002a). Chahnazarian (1991) argued that the normal SRB in a country with a reliable vital registration system should be from 104 to 107, which means 104 to 107 male babies born per 100 female babies. However, countries such as China, India, South Korea, and Taiwan have showed SRBs over 107 (Croll 2000). For example, SRBs are 117.0 in China in 2000, 111.0 in India in 1996-1998, 109.6 in South Korea in 2000, and 109.5 in

This dissertation follows the styles of *Demography*.

Taiwan in 2000 (Hudson and den Boer 2004).

Some studies (Coale 1991; Croll 2000; Hudson and den Boer 2004) estimated the numbers of girls who are “missing,” by taking the number of girls anticipated if there was a normal SRB minus the number of girls produced via an imbalanced SRB. For instance, Hudson and den Boer (2004) estimated that between 342,000 and 1.47 million girls were missing in China between 1985 and 1995. In addition, as many as 1 million females have been “missing” in China each year since 1995.

Scholars have pointed out three main cultural and economic reasons for son preference: family lineage, ancestor rituals, and support for old-aged parents (Park and Cho 1995; Larsen et al. 1998; Poston 2002a). Family lineage is based on patriarchal traditions, where only men can carry family names. Ancestor rituals have been important culturally in these countries. These rituals serve to maintain continuity for patriarchal customs and gender inequality because they are male dominated rituals with women having only minor roles. The support of elderly parents has an economic function. Historically, there were no health insurance and social welfare programs for the elderly in China and South Korea. Accordingly, the primary caretakers for old parents have been their offspring, especially their sons. Sons, primarily the eldest sons, accept the responsibility for parental caretaking (Larsen et al. 1998). With economic development, this cultural norm did not change much. Even though facilities for elderly care are now available, people still hesitate to institutionalize their parents in those facilities because institutionalizing parents implies the neglect of parents and tends to bring shame on the family.

Several scholars have argued that son preference is related to sociocultural factors of patriarchy (Arnold and Zhaoxiang 1986; Poston and Gu 1987; Gu and Roy 1995; Park and Cho 1995; Kim 1997; Poston 2002a) and gender inequality (Croll 2000; Hudson and den Boer 2004). With regard to China and South Korea, this sociological influence comes from Confucianism. Confucianism is concerned with the principles of good conduct, practical wisdom, and proper social relationships. It has influenced Chinese attitudes toward life, set the patterns of living and standards of social value, and provided the background for Chinese political theories and institutions. Confucianism spread from China to neighboring countries such as Korea, Japan, and Vietnam (Wikipedia, <http://en.wikipedia.org/wiki/Confucianism>). In terms of gender inequality, Confucianism propagated the natural order through a yin (female)-yang (male) system, with ascribed roles based on sex (Duechler 1983). Women are assigned the responsibility of domestic work such as child-bearing and rearing, household chores and supporting family members. Men are ascribed roles outside the home, especially the financial role of earning money. Also, there is sex ascription of roles related to rituals (Kendal and Peterson 1983; Cho 1983; Young 1983; Koh 1983; Kristeva 1986; Hudson and den Boer 2004). As Confucian ideology became prominent in a society, women's status was degraded (Kendal and Peterson 1983). An example of the Confucianism philosophy is in the Books of Songs (Kendal and Peterson 1983:90):

When a son is born

Let him sleep on the bed,

Clothe him with fine clothes
And give him jade to play with
How lovely his cry is!
May he grow up to wear crimson
And be the lord of the clan and the tribe.

When a girl is born,
Let her sleep on the ground.
Wrap her in common wrappings,
And give her broken tiles for playthings.
May she have no faults, no merit of her own
May she well attend to food and wine
And bring no discredit to her parents.

Imbalanced SRBs have the potential for future social problems. There could be a lack of brides when the cohort reaches marital age (Poston 2002b). If parents only have a son and their son cannot marry, this may cause support problems, because generally sons are accustomed to provide financial support for their older parents and daughter-in-laws are accustomed to providing caretaking for the elderly mothers and fathers-in law. The only son also will face the sole responsibility for their older parents' support, which in the past was usually shared by other siblings. Poston and Glover (2006) discussed possible scenarios to respond to the imbalanced SRB. First, the Chinese and South

Korean governments could turn to more authoritarian forms to control the bachelors. For instance, countries could modify the magnitude of the potential unrest of these unmarried young men by dispatching them to public works projects thousands of miles away from the big cities. In this case, political trends leading to democracy could be ended. Second, international marriage is another possible solution. This would be more likely in South Korea and Taiwan, countries with greater financial resources. Chinese males could possibly not afford “mail order brides” (a bachelor orders a bride via the mail through a wedding agency in another country). In addition, international marriages might cause racial problems in South Korea, since Koreans are very homogenous. When Koreans encountered mixed-race marriages between Americans and Koreans during the Korean War, the mixed race people experienced extreme discrimination by the majority (Kim et al. 2003). Another possible scenario is polyandry. However, because there is limited evidence of this historically in both countries, this is unlikely to happen. Fourth, increasing homosexuality is another possibility, even though this is a less likely solution, because homosexuality may well have a biological foundation. The authors, however, assumed that attitudes supporting the acceptance of homosexuality could well develop in both countries in this scenario. In addition, situational homosexuality could be another possibility. Some research has shown that people in sex-segregated communities such as prisons, the military, and single sex boarding schools often engaged in homosexual behaviors, even though they were not really homosexual persons (Eigenberg 1992; Kunzel 2002). This might be happening in these countries. Fifth, the most likely scenario is that Chinese and Korean bachelors will never marry and will settle in bachelors’

ghettos in big cities such as Beijing, Shanghai, Seoul and Pusan, and other cities, where commercial sex outlets are available. These large enclaves of unmarried bachelors might lead to an increase in criminal behaviors.

The emergence of abnormal SRBs in China and South Korea is closely related to the fertility decline. The total fertility rate (TFR) for both countries was around 6.0 in the 1950s and 1960s. Both countries were concentrated on agricultural industry, which led to couples having many children to cultivate the land. Then, both countries initiated economic development plans. However, the governments worried that economic development could not keep pace with population growth under high fertility (Greenhalgh and Li 1995). Accordingly, both governments launched family planning programs to reduce fertility.

During the last few decades family planning was very successful for both countries along with economic development. The TFRs of both countries declined to below the replacement level of 2.1. Even now the two countries are among the lowest low fertility countries in the world. For instance, the TFR of China in 2005 was 1.6 and the TFR of South Korea in 2005 was 1.1, which was one of the lowest low fertility countries in the world (Population Reference Bureau, <http://www.prb.org/pdf06/06WorldDataSheet.pdf>).

This rapid fertility decline led to the imbalanced SRBs. When a country has a TFR that is over 3.0, the possibility of having at least one son in the family is pretty assured. When it falls below 2.0, however, this possibility declines. Often couples take measures in order to have sons, thus resulting in abnormally high SRBs.

My dissertation focuses on three countries, namely, China, South Korea, and the U. S., and examines in each country the impact of son preference on fertility. China and South Korea represent countries that have son preference. These two countries also have similarities and differences, which will provide a deeper understanding of the dynamics of son preference. My dissertation also analyzes how economic development and women's status are related to son preference in China and South Korea.

With regard to the resemblances of the two Asian countries, first of all, they share the similar cultural background of Confucianism, which is known for supporting a strong patriarchal social system (Croll 1978; West et al. 1999). Second, the two countries have similar trends and patterns of fertility decline. As has already been described, fertility fell quickly during the last few decades. Third, related to the second, the imbalanced SRBs emerged during the 1980s when the TFRs dropped under 2.0.

China and South Korea are also different. First, economically, South Korea is a modern industrialized nation much more developed economically compared to China. For instance, Gross National Income (GNI) per capita of South Korea was \$16,291 in 2005 (National Statistics Office, http://kosis.nso.go.kr/cgi-bin/sws_999.cgi?ID=DT_1C20001&IDTYPE=3&FPUB=3), while the GNI per capita of China in 2005 was \$1,740 (The World Bank, <http://devdata.worldbank.org/external/CCProfile.asp?PTPYE=CP&CCODE=CHN>).

Some scholars assume that if developing countries with son preference attain certain levels of economic development, son preference should be reduced. But this has not happened (Croll 2000). Despite the successful development, China and South Korea,

including other Asian countries such as Taiwan, Vietnam, and India, still maintain strong son preference. Furthermore, Croll (2000) has argued that a reason for sustained son preference is related to gender inequality. A country with strong gender inequality sustains son preference regardless of economic development. Hence, this dissertation will examine the effect of women's status on son preference and fertility.

Family planning policy is another difference between the two countries. The one child policy in China is compulsory while the South Korean family planning policy is voluntary. But the patterns of fertility decline for the two countries are similar.

The United States will show contrasting results compared to China and South Korea. There is not much evidence that Americans have strong son preference compared to Chinese and Koreans. Prior studies on sex preference of American showed that sex preference in America was not the same as Chinese and Korean son preference (Coombs 1977; Pebley and Westoff 1982; Sloane and Lee 1983; Unger and Molina 1997; Pollard and Morgan 2002). For instance, several scholars (Pebley and Westoff 1982; Sloane and Lee 1983; Macionis 2007) have reported that Americans have a son preference for their first-born, because they wanted to pass on the family name through patrilineal lineage. However, their son preference does not lead to a sex-selective abortion similar to that occurs in China and South Korea. More importantly, scholars (Coombs 1977; Pebley and Westoff 1982; Sloane and Lee 1983; Pollard and Morgan 2002) have indicated that sex preference of Americans is closely linked to the desire for a balanced sex composition of children. American women with only two sons or daughters were more likely to have a third birth compared to women who already have

children of both sexes (Pollard and Morgan 2002). Accordingly, they concluded the third birth was caused by their desire to have a balanced sex composition, not by their son preference.

Unger and Molina (1997), however, found an interesting result of sex preference in the U. S. They found that Hispanic women with low socioeconomic status and who were Spanish speaking showed a higher likelihood of a higher order birth if they had a daughter or daughters as their previous child or children. However, the sample of this study was based on hospital patients in Los Angeles, not on the representative sample of the larger Hispanic population. Hence, the authors stated that the results could not be generalized. Therefore, my dissertation will also examine son preference among poor Hispanics in a much larger dataset.

This dissertation attempts to contribute the literature on son preference and fertility through a comparative perspective in three ways. First, it intends to examine the impact of son preference on fertility in China and South Korea compared with the U.S. The impact that a female birth has on the likelihood of a woman having a higher order birth is the most concern: women who have one or two daughter(s) as previous child(ren) are expected to be more likely to experience the hazard of having a second or a third birth. These analyses will pursue indirect information on one of the ways son preference leads to higher than average sex ratio at birth. The sex of the previous child will have an effect on the likelihood of another birth in China and South Korea, but not in the United States.

Second, my dissertation attempts to examine the effects of women's status on son preference. As noted, scholars have assumed that if modernization has progressed successfully, and women's status has increased, son preference, which is considered to be a traditional value, would be reduced and eventually be diminished (Croll 2000). However, in societies such as China and South Korea, with increase in economic development in the last few decades, son preference has not diminished. Croll (2000) gives a persuasive explanation for this strong son preference. She argues that son preference was related to gender inequality, and that gender inequality had been sustained during modernization and economic development; thus son preference also remained. Therefore, my dissertation will examine her argument: whether or not women's status influences son preference in a negative way. Women's educational attainment is used as a measure of women's status in this dissertation.

Third, my dissertation examines son preference and fertility in the U. S. As I described before, the U. S. has never shown son preference in terms of a high SRB. In addition, many scholars (Coombs 1977; Pebley and Westoff 1982; Sloane and Lee 1983; Pollard and Morgan 2002) have suggested that sex preference for Americans is related to the desire for a balanced sex composition of children, not for son preference. Research, however, has shown this association to exist among poor Hispanics. My dissertation will use data from a national sample, the 2002 National Survey of Family Growth Data.

There are six chapters in my dissertation. Following this introductory chapter, chapter II discusses the cultural factor of son preference and reviews literature dealing with son preference in China, South Korea, and the U. S. My review shows that few

studies have been conducted using the sex of the previous child. Chapter III discusses data sources, methods, measurements, and the research hypotheses. Chapters IV and V present the descriptive statistics and the results of the hazard analyses, by examining the likelihood of having another birth if women had a daughter(s) as their previous child(ren), and compares those results with the U. S. Chapter IV deals with women who had a daughter as their first live birth, and chapter V deals with women who had daughters as their first two live births. The final chapter summarizes the results of the hazard analyses; the effects of son preference on fertility, the effects of women's status on son preference, how these effects varied by groups (women with a daughter as their first child and women with daughters as their first two children) and nations, namely, China, South Korea, and the U. S. Also, the final chapter discusses the limitations and implications of my dissertation.

CHAPTER II

LITERATURE REVIEW

This chapter discusses the literature on son preference in China, South Korea, and the U. S. In my dissertation, I first analyze the relationship between the fertility decline and imbalanced SRBs: how rapid fertility decline in China and South Korea results in abnormal SRBs. Then, an exploration is undertaken about the direct outcomes by son preference such as infanticide, underreporting, abandonment, and sex selective abortion. Also explored is the relationship between cultural roots for son preference and gender inequity, i. e., how traditional culture in China and South Korea allows and sustains gender inequity, leading to strong son preference. This review will help to develop the research hypothesis with regard to the impact of women's education on son preference. Next, even though not enough studies have been conducted in terms of an empirical base, my dissertation reviews those prior studies and factors involved. More importantly, this review shows prior research used the sex of the previous child as an indirect explanation for son preference, which is the main variable in my dissertation. This review also assists to develop other covariates such as mother's age, education, and residence, which are related to son preference. Finally, the review of the U. S. literature shows how sex preference in America has been studied in terms of the balanced sex composition of children, not son preference. There is evidence, however, that Hispanic

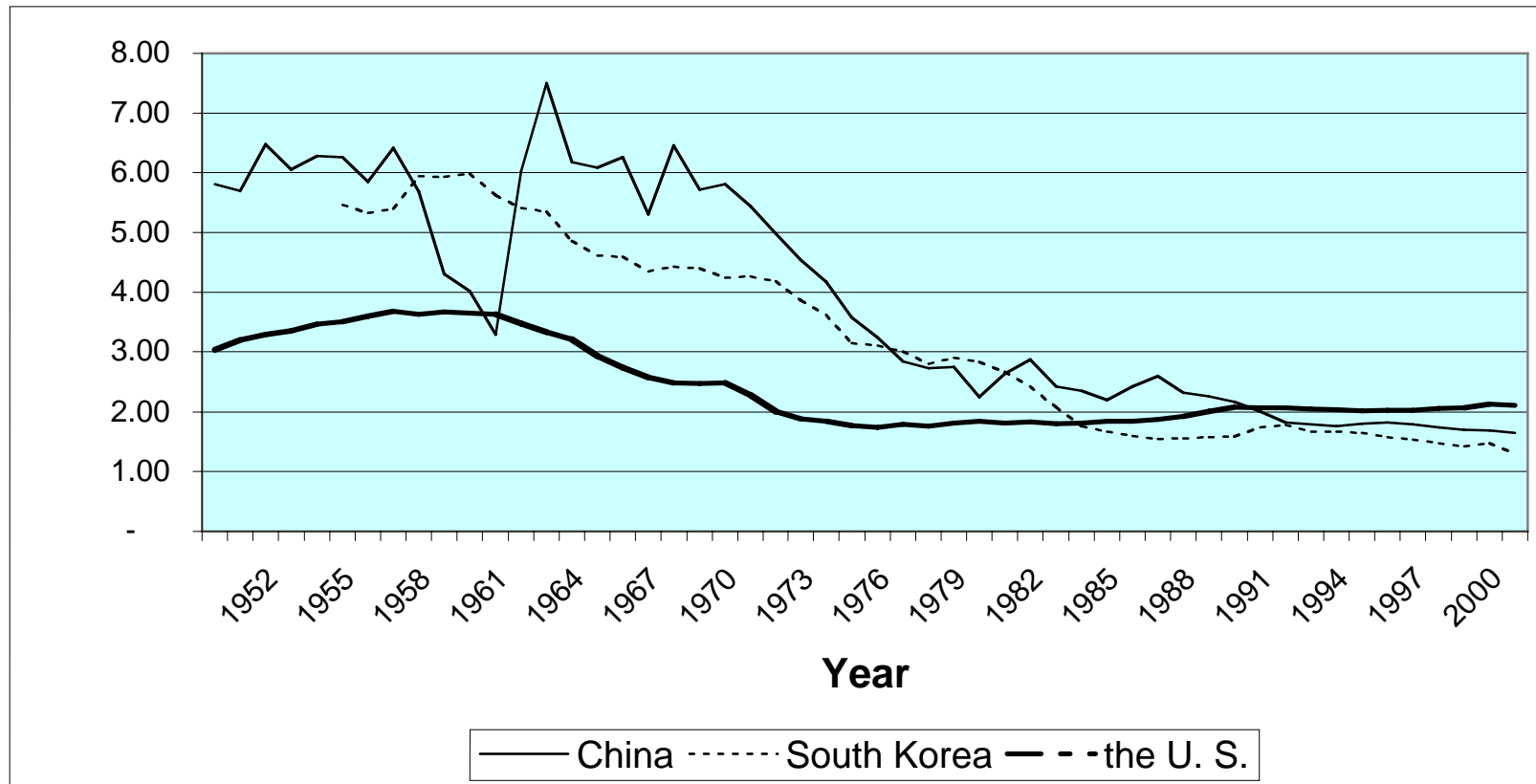
women with low socioeconomic status have son preference (Unger and Molina 1997). Thus, this chapter also analyze the factors involved in Hispanic women's son preference.

Fertility Decline and Sex Ratio at Birth

Fertility Decline

Fertility has continuously declined in China, South Korea, and the U. S., since the 1960s for China and South Korea, and since the early 20th century for the U. S. (Population Reference Bureau, <http://www.prb.org/AmeristatTemplate.cfm?Section=Fertility&template=/ContentManagement/ContentDisplay.cfm&ContentID=2335>), respectively. However, the pace of fertility decline for China and South Korea was much faster than that of the U. S. (see Figure 1). The fertility of China and South Korea was around 6.0 in the 1950s (Poston 2000; Poston et al. 2003). At that time, both countries were primarily agricultural societies, which, according to wealth flow theory (Caldwell 1980), encouraged families to have many children to cultivate the land.

Figure 1. Total Fertility Rate for China, Taiwan, and South Korea: 1950-2000



Source: China, Census Bureau, (www.census.gov); South Korea, National Statistics Office (www.nso.go.kr); the U. S., Census Bureau, (www.census.gov)

Many scholars (Kim 1997; Cho and Chang 1991; Poston and Kim 1992) indicated that the main reasons for this rapid fertility decline were successful economic development, enhancing women's status via education and labor force participation, and strong government family planning.

During the 1960s the high fertility rate began to decline in both countries. After the communists gained power in China, the Chinese government implemented a family planning program to control population growth. In South Korea, the demographic transition to modernity caused rapid population growth, taxing the national economy. The Gross National Product (GNP) and the Gross National Income (GNI) and Gross National Income (GNI) per capita in both countries significantly improved. The GNP in China grew from \$222 billion (in U. S. dollars) in 1982 to \$1,233 billion in 2002, a six fold increase in 20 years. The GNI per capita has increased nine times during the same period: from \$430 in 1980 to \$3,950 in 2001 (The World Bank 2005). South Korea's economic improvement is more astonishing (National Statistics Office, http://kosis.nso.go.kr/cgi-bin/sws_999.cgi?ID=DT_1C20001&IDTYPE=3&FPUB=3). The GNI increased over ninety-six times during the past 35 years: from \$8.2 billion in 1970 to \$91.2 billion in 1984, and to \$786.8 billion in 2005. The GNI per capita changed over sixty-four times during the same period: from \$254 in 1970 to \$2,257 in 1984, and to \$16,291 in 2005. The economic development allowed people to have a better standard of life including urbanization, modernized medical and health system, and modernized values instead of traditional ones.

Enhancing women's status through education and labor force participation played an important role to reduce fertility. In general, the more educated women have a better knowledge of contraception, more liberalized attitudes about having fewer children, and more control in the childbearing decision (Mason 1987). In addition, enhancing women's education in particular helped to diffuse contraception. Another thing to notice for educated women is the time of childbearing. The more educated women spend more time on their education and career, thus, the time of childbearing is delayed. Therefore, the percentage of children produced by women in their twenties continued to decrease (Kim et al. 2000). Delayed childbearing was another key factor in reducing fertility. The most productive group of women, those in their twenties, did not produce the children they would have produced in the high fertility era.

Limiting the number of children in each family was a necessary part of successful economic development. Thus, the national family planning programs were concurrent with economic development, so that government family planning was another influential factor in reducing fertility. The governments in both countries set up family planning agencies covering even the rural areas. Before that time, the most commonly used contraception was withdrawal, which has a low percentage of success (Kim and Poston 1992; Poston and Kim 1992). Thus, during these times, Chinese and Korean women did not have a scientific or very effective method for controlling fertility. The family planning program and supporting agencies, allowed women easy access to contraceptive education and more effective methods such as the IUD, condom, and so forth. In addition, the cultural diffusion of information propelled the spread of

awareness and acceptance of contraceptive methods. Discussing personal sexual lives with government staff was not a comfortable issue for the women of that time. Thus, women who successfully used contraceptive methods and family planning education provided by the government assisted in the diffusion process; they often told their own stories to their relatives and close friends. This was one of the important reasons why family planning was so successful in China and South Korea.

There is a big difference, however, between the social and political designs of family planning programs in China and South Korea. China implemented a restricted and strong policy, known as the “One Child Policy”, in 1979. This policy restricted the family to only one child regardless of the child’s sex, although there was some flexibility depending on the family’s race/ethnicity and residence (Nie and Wyman 2005). In contrast the South Korean family planning policy was voluntary. The Korean fertility decline occurred with the voluntary participation of the South Korean people along with a strong successful economy (Kim 1993).

All these factors worked successfully and effectively in both countries to lower fertility. For example, the TFR’s in both countries were around 6.0 during the 1950s-1960s (see Figure 1), then dropped to around 4.0 in 1970s, and finally reached the replacement level, 2.1, in the 1980s. In spite of reaching the desired replacement level in the 1980s, fertility in China and South Korea continued to decline. The TFR in China was 1.9 in 1995, 1.8 in 2000 (National Statistics Office, http://kosis.nso.go.kr/cgi-bin/sws_999.cgi?ID=DT_2KAA207&IDTYPE=3&A_LANG=1&FPUB=3&SELITEM =), and 1.6 in 2005 (Population Reference Bureau, <http://www.prb.org/pdf06/>

06WorldDataSheet.pdf). The TFR in South Korea was 1.7 in 1995, 1.5 in 2000, and 1.1 in 2005 (National Statistics Office, http://kosis.nso.go.kr/cgi-bin/sws_999.cgi?ID=DT_2KAA207&IDTYPE=3&A_LANG=1&FPUB=3&SELITEM=). Currently China and South Korea are among the world's lowest fertility nations.

Meanwhile, the fertility decline in the U. S. progressed at a slower pace than in the other countries. The U. S. fertility decline took over a century to decline from 6.0 to around 2.0, whereas this decline took only 30 years in China and South Korea (see Figure 1). In addition, the current TFR in the U. S. is relatively high compared to other developed and developing countries, including China and South Korea. For instance, the TFR of the U. S. in 2005 was 2.0. However, in China and South Korea, this rapid fertility decline led to another problem, the imbalanced Sex Ratio at Birth (SRB), which will be discussed in the next section in detail.

Sex Ratio at Birth

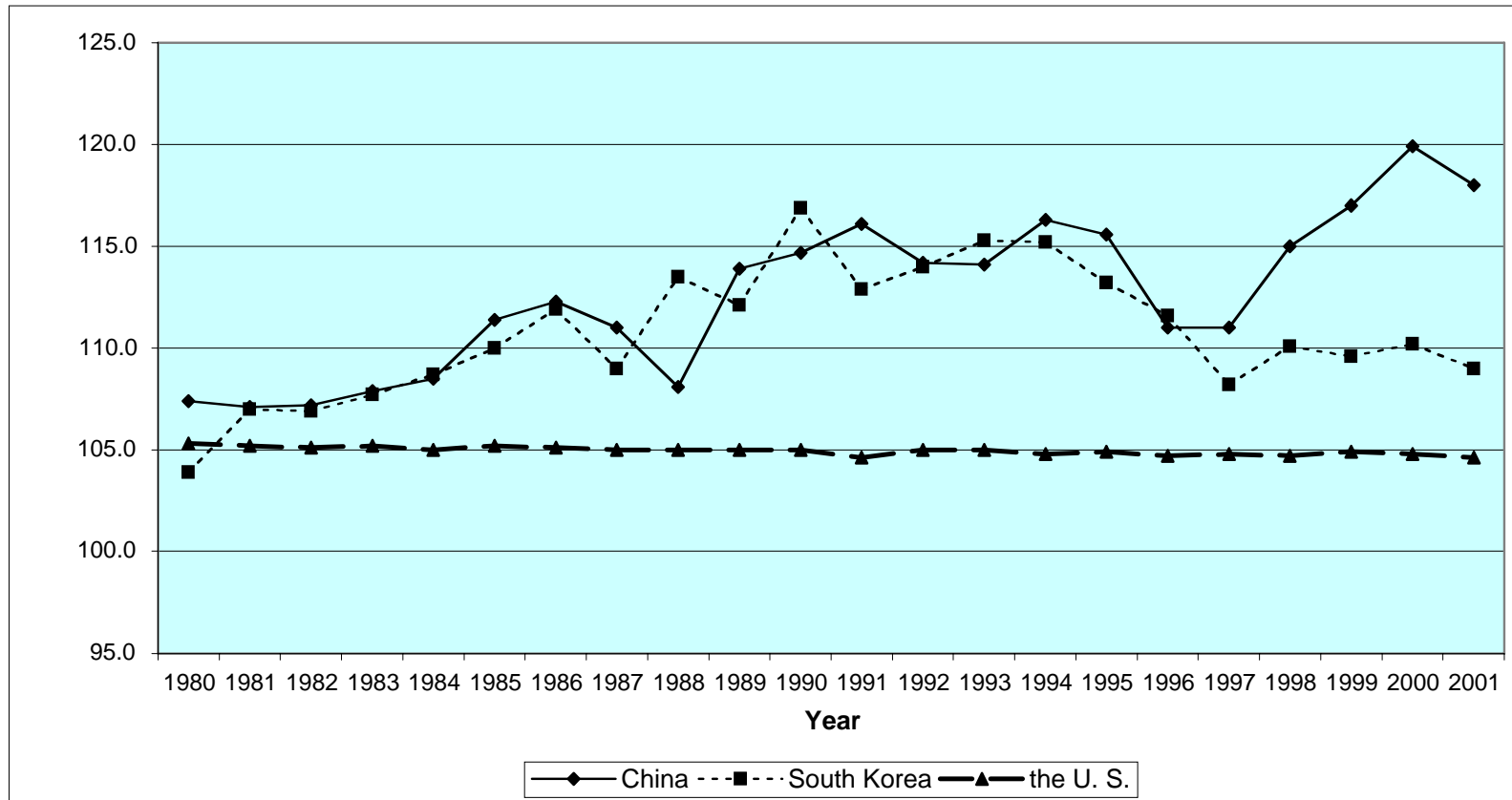
The Sex Ratio at Birth (SRB) is the ratio of male live births to 100 female live births. In general, the SRB is around 105, indicating 105 male births per 100 female births. Because of higher mortality rates for males, the sex ratio is about 100 when males and females reach the marital age. Even though there is some variation in SRB, it should be around between 104 to 107 (Chahnazarian 1991).

When the Total Fertility Rate (TFR) was over 3.0, the chance of having a son in the family was usually assured. When the TFR went down under 2.0, however, the chance of having a son became uncertain. Figure 2 indicates the trends of SRBs among

China, South Korea, and the U. S. The imbalanced SRBs emerged during the 1980s when the TFR went under 2.0. For instance, the SRB in China was 107 in 1980, increased to 111 in 1985, and increased to 114 in 1993 (Gu and Roy 1995). Then, the SRB in 2000 rose even higher, to 117, and still remains abnormal (Min 2005). The SRB in South Korea was 104 in 1980, increased to 110 in 1985, and peaked at 114 in 1993 (Gu and Roy 1995). The South Korean SRB in 2002 was still 110, an abnormal level. Furthermore, the imbalanced SRBs were even higher for the second or higher parity births (Park 1983; Choe, Kim, and Lee 1993; Gu and Roy 1995; Park and Cho 1995; Poston 2002a), because the desire to have a son increased when women were having a second or higher order birth.

A number of explanations have been offered to account for these imbalanced SRBs such as the underreporting of female births, female adoption or abandonment, infanticide, and gender selective abortion (Croll 2000; Poston 2002a; Hudson and den Boer 2004). Women who delivered a daughter might not register their daughter (Hull 1990; Zeng et al. 1993). Unreported daughters would therefore not become part of the vital statistics. Hull (1990) suggested that the female births actually took place, and the female children survived and are still alive today, but were concealed from the interviewers, local officials and health workers. As a result, those girls are missing from the official statistical data and survey findings. The Public Security Ministry in 1988 estimates that there are about one million children not registered with the authorities and undoubtedly most of them are girls.

Figure 2. Sex Ratio at Birth for China, Taiwan, South Korea, and the U. S.: 1980-2001



Source: China, Poston (2000a); South Korea, National Statistics Office (www.nso.go.kr); the U. S., National Center for Health Statistics (www.nchs.org)

Zeng and his colleagues (1993) found evidence indicating that the underreporting of female births accounts for about 43 percent to 75 percent of the difference between the biologically possible SRB and the reported SRB during the second half of the 1980s. One recent study indicated that underreporting of female births existed and was quite common (Merli and Raftery 2000). The reported first-birth intervals of Chinese women were lengthened by the underreporting of female births and by replacing them with second births reported as first births. This would lead to a large underreporting of the TFRs in China.

Johansson and Nygren (1991) hypothesized female adoption as a reasonable immediate cause for the rise in the sex ratio at birth in China. They estimated that about half of the “missing” girls in China in the 1980s were adopted children whose births were not reported to the government.

Another explanation for the rising SRB in China, according to Hull (1990), is female infanticide. The missing females were born, but died soon after birth, as a result of deliberate action by the parents. Female infanticide has a long tradition in China, but tradition alone cannot explain the recent rise in sex ratios. This phenomenon in recent years is not as common as in the years before the 1950s, but it has not been completely discontinued, especially in rural China.

In the 1980s the female infant mortality rate was increasing while the male infant mortality was decreasing (Gu and Li 1994). Johansson and Nygren (1991) found that the sex ratio among infant deaths in China was 114 males per 100 females in the 1980s, lower than the normal ratio of about 130. Gu and Li (1994) claimed that

infanticide and abandonment were relatively less responsible for the rise in the SRB in China. Nevertheless, their work indicated that female babies were more frequently subject to abandonment than male babies, primarily in rural areas. Some demographers have excluded infanticide as a possible reason. They hold that the underreporting of female births and sex selective abortion explained most of the recent increase in the imbalanced SRBs in China and South Korea (Hull 1990; Bae 1991; Zeng et al. 1993; Han 1994; Gu and Roy 1995; Park and Cho 1995; Westly 1995; Goodkind 1996; Shin 1998; Hudson and den Boer 2004).

Beginning in the 1980s, the availability of ultrasound machines allowed people to detect the sex of the fetus. When women knew their fetus was a female they often aborted. Even though this sex selective abortion was illegal in both China and South Korea, scholars believed sex selective abortion was the main cause for the imbalanced SRB. Although prenatal sex identification and gender specific induced abortion were illegal, the strong desire for having a son and the continuing demand for fewer children drove the demand for this illegal practice. According to a popular daily newspaper in South Korea (The Chosun Daily Newspaper, http://www.chosun.com/site/data/html_dir/2006/11/29/2006112960517.html), because fetus sex identification was illegal, gynecologists give a hint to their prospective mothers about the sex of the fetus in subtle ways by saying, “You are not going to be disappointed of the outcome of this pregnancy.” Therefore, prenatal sex identification followed by gender-specific induced abortion has become the most likely explanation for the imbalanced SRBs in China and

South Korea. Warren (1985) assumed that 29 fetuses out of 30 abortions were suspected to be females.

Son Preference, Confucianism, and Its Gender Inequality

In this section, I discuss the cultural background of son preference, which leads to the imbalanced SRBs. In addition, the dissertation deals with its relevance for gender inequality. As discussed earlier, son preference led SRBs in China and South Korea to be abnormal. Scholars claimed that both economical and cultural factors were involved, with an emphasis on cultural reasons (Arnold and Zhaoxiang 1986; Poston and Gu 1987; Gu 1994; Park and Cho 1994; Park and Cho 1995)¹. They argued that son preference was more related to sociocultural reasons, and Croll (2000) and Hudson and den Boer (2004) also suggested its relevance with gender inequality. In addition, analyzing the relationship between culture and gender inequality justifies the examination of the impact of women's status in a society.

¹ There is also an explanation for gender inequality based on the economic system. Boserup (1970) argued that agriculture as a social production system could be another explanation of why male dominance and son preference were prevalent in these two countries. She insisted that men in agricultural societies might have higher social status compared to other productive system, because the nature of agriculture requires male physical strength. Hence, men could claim more power such as the distribution and consumption of resources. In addition, because of the labor demand in agriculture, people preferred sons. However, due to the high infant mortality rate, high fertility was common. As a result, China and Korea had high fertility rates when both societies were mainly agricultural. My dissertation, however, focuses on cultural reasons, because cultural relevance with gender inequality and son preference in the case of China and South Korea are more persuasive.

Scholars pointed out three main reasons for son preference: family lineage, ancestor rituals, and support for one's old-aged parents (Park and Cho 1995; Larsen et al. 1998; Poston 2002a). Family lineage is based on the patriarchal tradition that only men can carry their family names. It is very common to hear from the elderly that they would like a grandson before they die, and when they have a grandson their responsibility to their ancestors is accomplished. Rituals for the ancestors have been a very important cultural tradition in both China and South Korea. The main roles of the rituals, however, are performed by males; females only have supportive roles, e.g., preparing food. These male-dominant rituals allow women to perform minor roles, thus, perpetuating the continuity for patriarchal customs and gender inequality. The male child also has the economic function of providing the primary support for old-aged parents. Historically, China and South Korea do not have health insurance and social welfare programs for the elderly. As a result, the primary caretakers for parents have been their offspring, especially the sons. Sons, primarily the eldest son, take the main responsibility (Larsen et al. 1998). During economic development, however, this cultural norm did not change. Even though facilities for elder care are now available, people hesitate to institutionalize their parents in those facilities. Institutionalizing aged parents implies an abandonment of one's own parents. This abandonment of responsibility places the family.

Several scholars argued that son preference is more related to sociocultural reasons (Arnold and Zhaoxiang 1986; Poston and Gu 1987; Gu 1994; Park and Cho 1995), and also related to gender inequality (Croll 2000; Hudson and den Boer 2004).

China and South Korea have the same cultural background, known as Confucianism. Confucianism was founded by Confucius around the 5th century BC. It was developed from the teachings of Confucius and his disciples (Hudson and de Boer 2004). Confucianism is concerned with the principles of good conduct, practical wisdom, and proper social relationships. It has influenced the Chinese attitude toward life, set the patterns of living and standards of social values, and provided the background for Chinese political theories and institutions. It also has spread from China to neighboring countries such as Korea, Japan, and Vietnam.

This Confucian culture became dominant in the Chinese and Korean societies around the 14th century when Neo-Confucian philosophy became prominent (Kendall and Perterson 1983; Hudson and den Boer 2004). Neo-Confucian philosophers in China and South Korea were stricter about institutionalizing the Confucian rules. South Korea (a new dynasty, Yi, established at that time) imported the Neo-Confucian philosophy for rebuilding their new social order (Choi 1979). Due to this institutionalizing process of Confucian ideology, women in China and Korea gradually lost their rights including equal rights of inheritance, remarriage, and ritual participation (Choi 1979; Deuchler 1983; Kendall and Perterson 1983; Hudson and den Boer 2004). In addition, Confucianism propagated the natural order by yin (female)-yang (male) system and ascribed roles based on sex (Deuchler 1983). Women are assigned the responsibility of domestic work such as child-bearing and rearing, household chores and supporting family members. Men are ascribed roles outside of the home, especially the financial role of earning money. Rituals also had been assigned by gender (Cho 1983; Kendal and

Peterson 1983; Koh 1983; Young 1983; Kristeva 1986; Hudson and den Boer 2004). Representative examples of indicating gender inequality in Confucian ideology are the “Three Obediences”(White 2003), the “Four Virtues,” and “Nam Zun Nu Bei” (Hudson and den Boder 2004). The “Three Obediences” described women’s obedience during her lifetime: women should obey their father before the marriage, obey the husband after the marriage, and obey their son when their husband died. The “Four Virtues” codified women’s subordinate behaviors toward men. It explained and ruled propriety in behavior, speech, demeanor, and employment. The “Nam Zun Nu Bei” is a kind of slogan for Neo-Confucians, which means, “treat men as superior, women as inferior.”

After World War II, both China and South Korea planned to develop their countries to become modernized and industrialized. To fulfill their goals, the governments of both countries initiated development plans. As discussed earlier, economic development rates for both countries during this past several decades were astonishing.

Greenhalgh (1985), Park (1993), Greenhalgh and Li (1995), Kim and Moon (1999), and Croll (2000), however, argued that women were disadvantaged compared to men even during these development processes. Data on occupations, positions, and wages show that women are still far behind men (Pong and Post 1991; Zhou, Tuma and Moen 1996; Xiyi 1999; Kim and Moon 1999; West et al. 1999; Zhang, 1999). For example, most Chinese women work at textile companies which need low skills and low education. In addition, Chinese women received less income. Korean women also work at lower status occupations such as in the service industry; therefore, they earn less income.

Korean women are more likely to work as part-timers; over two-thirds of the part-timers are women. Gender inequality increased during the economic hardships. Hard times in South Korea, for example, women were the first victims to be laid off in the economic recession during 1997-1998 (Kim and Moon 1999).

In addition, childbearing and childrearing are considered as women's responsibilities. People still think that the mother is the most responsible person for childrearing. Even though fathers are more involved childrearing than in the past, women do most of the childrearing and household chores. A society with a strong patriarchy shows less support for women's childrearing, a society with less gender inequality shows more support for women's childrearing.

Lopez-Carlos and Zadihi (2005) confirmed the continuing situation of gender inequality in China and South Korea. The World Economic Forum has measured and reported the gender gap in five categories including economic participation, economic opportunity, political empowerment, educational attainment, health and well-being in 58 countries. The Nordic countries performed very well in gender equality. In contrast, China was ranked overall 32nd among the 58 countries. South Korea was ranked 54th overall. China's gender inequality is not as bad as gender inequality in South Korea, probably because gender equality is promoted by the communist government (Arnold and Zhaoxing 1986).

In addition, family planning itself was based on gender discrimination. Even though both parents are involved in having a child, the main target of family planning was women. The government focused on controlling women to reduce fertility.

Therefore, only women received contraceptive education and methods. Greenhalgh and Li (1995) reported how the one child policy was initiated and was negotiated between the central and local governments, and the local government and citizens, based on gender. Recently, the one child policy was loosened in terms of gender considerations. If the family had only a daughter, they could have a second chance, because the government sympathized with those families and agreed to allow another birth.

Empirical Studies

China and South Korea

This dissertation focuses indirectly on sex preference using the sex of the previous child. As noted before, few studies have examined this relationship. In addition, those studies usually did not focus on the impact of women's status on son preference and fertility.

Poston (2002a) conducted a hazard analysis for China, using 1997 Chinese fertility data. He estimated the likelihood of having a second birth or a third birth using the sex of the previous child as an independent variable; he found the sex of the previous child influenced having higher order births. Then, he also examined the impact of other covariates such as mother's age, education, race/ethnicity, and policy on fertility. The results showed that the older a woman's age at the time of her first birth, the fewer the number of total children she would have; the more educated, the fewer her number of

ever-born children; in terms of majority status, Han women had a lower hazard of having another birth.

In the case of South Korea, studies have been conducted also using the sex of the previous child (Park 1983; Cho and Ahn 1993; Lee 1996; Larsen et al. 1998). For instance, Lee (1996) reported that the sex composition of the previous children influenced the decision to have the next birth. He used 1974 Korean Fertility Survey data and found that the fertility was higher among women with only daughters, and thus, concluded that son preference had an impact on fertility. Park (1983) used the same dataset and found the same results as Lee. The only difference between these two studies was the analytical methods; Park used a log-linear analysis. Cho and Ahn's study (1993) also supported the previous studies.

Larsen et al. (1998) analyzed son preference and fertility in South Korea using Kaplan-Meier life table methods. The 1991 Korea National Fertility and Family Health Survey data were used. They explored the likelihood of conception in women who had only daughters compared to those who had only sons. They reported women with a son were less likely to have another child, but women with a daughter were more likely to have another child. Thus, they concluded that the fertility decline was interrupted by son preference. They also examined the impact of other factors such as the presence of male offspring, patriarchy, and modernization, on having another birth, and found all those factors were strong predictors for higher order birth.

More recently, Kim et al. (2000) investigated the existence of son preference in South Korea using the 2000 Korean Fertility Survey data and found evidence that son

preference is still sustained. But they did not pay attention to women's role in their model.

The United States

As described earlier in this chapter, U. S. fertility has steadily declined along with increasing economic development (see also Figure 1). In addition, the SRBs in the United States have never been abnormal (see also Figure 2). Americans do not follow a Confucianism ideology as Chinese and Koreans do. Son preference has never been a major research topic in the U. S. My dissertation will use the United States as a contrast for comparing the two countries who have known son preference, China and South Korea.

Several studies have focused on sex preference in the U. S. (Markle 1974; Coombs 1977; Wood and Bean 1977; Pebley and Westoff 1982; Sloane and Lee 1983; Unger and Molina 1997; Pollard and Morgan 2002). Those studies have reported that Americans had a sex preference, but it was not the same as in China and South Korea. Those studies reported that Americans wanted a son as their first-born, because American lineage is also patrilineal, and Americans transfer lineage via the male children. However, scholars found that American women are more likely to have another birth when they have only same sex children: only daughters or only sons (Freedman, Freedman, and Whelpton 1960; Westoff and Rindfuss 1974; Wood and Bean 1977; Pebley and Westoff 1982; Sloane and Lee 1983; Teachman and Schollaert 1989; Pollard and Morgan 2002). This is totally different from son preference in China and South

Korea. If women have only two sons, they are more likely to have a third birth, hoping to have a daughter. Consequently, prior studies strongly imply that American sex preference is related to the desire for a balanced sex composition of their children. Also, American sex preference does not seem to lead to sex-selective abortion like China and South Korea.

Unger and Molina (1997) reported an interesting result with regard to sex preference in the U. S. They investigated Hispanic women who were patients in obstetrics and gynecology clinics in the Los Angeles area to determine if there was son preference. The results indicated that Hispanic women wanted more sons than daughters: on average they wanted 2.8 sons but only 0.1 daughters as their desired number of children. In addition, they found that “being older than 30; having no more than an eighth grade education, being separated, divorced or widowed; being Spanish speaking; or having been born outside the U. S.; and having a large family of origin were all positively associated with a desire for a greater number of sons” (Unger and Molina 1997:284-287). According to them, the reason why scholars have not paid attention to Hispanic women’s son preference in the U. S. was, first, the existence of son preference was not immediately obvious, and the second, the U. S. culture does not have strong son preference. However, they found that Hispanic women with low socioeconomic status were more considered to maintain more traditional values than women with high economic status; this showed strong son preference. We also can think of an additional hypothesis; this pertains to the lack of a social support system for girls and women. If a woman experiences throughout her life extremely unequal treatment due to being a

daughter, she might believe that having a son would be better and thus prefer to have a son instead of a daughter, even if she does not have strong son preference.

This study, however, had some limitations. First, the sample was based on hospital patients in Los Angeles. This implies that the sample may not be representative of the whole Hispanic population in California or the nation. Second, due to data limitation, the survey used preferred language as a validated acculturation variable. Third, the study could not access the sex of the previous child of the respondents, which is a very important piece of information in such an analysis.

This chapter has reviewed the literature on son preference in China, South Korea, and the U. S. I found there are a limited number of empirical studies conducted on China and South Korea. This dissertation will thus endeavor to provide empirical evidence on son preference for both countries, using most recent fertility survey data. In contrast, the U. S. will be used as a contrasting case.

This dissertation will go beyond exploring son preference in China and South Korea. Prior studies have not focused on the impact of women's education on son preference. Women's education has been used only as a control variable. The literature dealing with fertility decline, however, indicated that women's education plays a crucial role in reducing fertility. It has been shown that women's education lessens son preference. But to Croll (2000), women's status did not reduce son preference. Son preference was strong and prevalent in countries with successful economic development. My dissertation examines this relationship, namely, how women's education influences son preference in second and third order births.

CHAPTER III

METHODOLOGY

This chapter describes the data and methodology used in my dissertation. First is a description of the data and its sources. My dissertation uses fertility survey data from each of these countries. Second is a description of the measurement of the dependent and independent variables. Third is a description of the methodology, namely, Cox's partial-likelihood hazard model. My dissertation reports graphical curves, namely, Kaplan-Meier (K-M) Survivor Graphs, for an easier understanding of the probability of surviving the hazard of having a second or third birth for each months of analysis time. Finally, my dissertation conducts another series of hazard analyses to examine the interaction effects between women's education and the sex of the child for China and South Korea. In case of the U. S., similar hazard models are estimated for Hispanic women only.

Data

China Data

The Chinese data are from the 1997 Sample Survey of Population and Reproductive Health (SSPRH). This survey was conducted in 1997 by the State Family Planning Commission of China. The SSPRH collected data on the health and

reproductive behavior of a nationally representative sample of 15,213 married and unmarried women between the ages of 15 and 49. The data consist of 250 variables including age, education, marital status, age at first marriage, pregnancy history, birth control history, reproductive medical history, age at menarche, and menopause. Since reproductive data are only available for ever-married women, I selected two sets of data for the analysis. The first dataset includes women with one child, and the second includes women with two children.

The data observations contain the following restrictions (see Poston 2002a:338-40). The restrictions are applied in the same way for each country. A woman whose baby died more than 9 months before the termination of her pregnancy was not counted as having a live birth. It is not expected that the sex of this now dead child will have an impact on the woman's likelihood of having another child. However, a child who died less than 9 months before the termination of the woman's next pregnancy is considered as having a live birth. Also, the first birth needs to have occurred at least 9 months before the date of the survey. A woman who had a birth less than 9 months before the date of the survey had virtually no chance of having another birth by the date of the survey. Such a woman is not included in the study. Furthermore, the number of months between the first birth and the second birth should not equal zero. Whenever this occurred, it was assumed that the woman had twin births, so she was excluded from the study.

After imposing these restrictions on the Chinese data, a total of 11,157 married women who had at least one child by September 1997, the date of the survey, were

available for the first analysis. A total of 6,882 married women who had at least two children by September 1997 were available for the second analysis.

South Korea Data

The South Korean data are from South Korea's National Fertility and Family Health Survey conducted in 2000. This survey is conducted by the Korea Institute for Health and Social Affairs (KIHASA) every 3 years (Kim et al. 2000). The data were collected from July 19th, 2000 through August 31st, 2000. The data consist of over 300 variables including pregnancy and contraceptive history, abortion experiences, and family values, family health, women's employment, and so on, from 13,249 households. The sample was based on 200 census tracts, and included only married women between the ages of 15 to 64. Weights are used in my analysis. After using the same restrictions for the data selection as were used with the Chinese data, a total of 5,819 women who had one live birth by August 2000 were available for the first analysis. A total of 3,972 married women who had at least two live births by August 2000 were available for the second analysis.

The U. S. Data

The United States' data are from the 2002 National Survey of Family Growth, Cycle 6. This survey was conducted from January 2002 through March 2003 by the Institute for Social Research under contract with the National Center for Health Statistics

(NCHS 2004). Individual interviews were conducted with 7,643 women between the ages of 15 to 44, and 4,928 men aged 15 to 44, for a total sample size of 12,571. Weights were also applied to the U. S. data sample as appropriate for the hazard model. There are three parts to the survey files: female files, male respondent files, and a female pregnancy (interval) file. The female respondent file includes demographic information, pregnancy history, abortion-related information, marital and cohabitation history, fecundity, birth expectations, contraceptive use, pregnancy desirability, use of family planning services, infertility, and so on. The male respondent file includes demographic information himself and his wives, cohabiting partners, recent sexual partners, contraceptive use, infertility, biological and adopted children, birth expectations, and activities with his children, among other topics. The female pregnancy file contains detailed pregnancy histories, desirability of pregnancies, as well as selected respondent characteristics. This dissertation only uses data from the female pregnancy file due to its greater detail and suitability to address my hypotheses. After applying the same restrictions for data selection as in the Chinese data, a total of 3,151 women had one live birth by March 2003 were available for the first analysis. A total of 2,180 married women who had at least two live births by March 2003 were available for the second analysis.

Measurements

This section explains the measurement of the independent variables. The first analysis examines the hazard of moving from a first to a second birth. The main

independent variable in this analysis is the dummy variable (GIRL1), scored 1 if the first child is a girl, and 0 if a boy. In the second analysis, the hazard of moving from the second birth to a third birth was examined. A dummy variable (GIRLS) is scored 1, if both of the first two children are girls, 0 if otherwise; a second dummy variable (DAUGHTER-SON) is scored 1, if the first child is a girl and the second a boy, 0 if otherwise; a third dummy variable (SON-DAUGHTER) is scored 1, if the first child is a boy and the second a girl, 0 if otherwise; a fourth dummy variable (SONS) is scored 1, if the first two children are boys, 0 if otherwise. This fourth variable is used as the reference group.

Other independent variables (covariates) are defined and measured as follows²:

- 1) The woman's age when she had her first child (AGE-BIRTH1), or her second child (AGE-BIRTH2) measured in years;
- 2) Whether she lives in urban areas (URBAN), scored 1 if yes, 0 if no;
- 3) Whether she is Han (HAN), scored 1 if yes, 0 if no;
- 4) Whether she is Hispanic origin (HISPANIC), scored 1 if yes, 0 if no;
- 5) Whether she is White (WHITE), scored 1 if yes, 0 if no;
- 6) Whether she is Black (BLACK), scored 1 if yes, 0 if no;

² The HAN and POLICY variables are only used in the Chinese models. The URBAN variable cannot be used in the Chinese models due to data limitations. In the Chinese model, ILLITERATE is used as the reference group, the South Korean model uses ELEMENTARY as the reference group, and the U. S. model uses JUNIOR as the reference group, due to differences in women's educational attainment. Ethnic variables such as HISPANIC, WHITE, and BLACK are used only in the U. S. model. OTHERS is used as the reference group.

- 7) Whether the woman had a first or a second birth prior to the one child policy implementation (POLICY1 or POLICY2), scored 1 if yes, 0 if no;
- 8) Whether she obtained an elementary school level education (1-6 years of school) (ELEMENTARY), scored 1 if yes, 0 if no;
- 9) Whether she obtained a junior school level education (7-9 years of school) (JUNIOR), scored 1 if yes, 0 if no;
- 10) Whether she obtained a high school level education (10-12 years of school) (HIGH), scored 1 if yes, 0 if no;
- 11) Whether she obtained a college level education (13+ years of school) (COLLEGE), scored 1 if yes, 0 if no.

I expect that older women at the first or second birth will have a lower likelihood of having another birth since women show a decline of having another birth with age. This study hypothesizes that urban women will show less son preference, because they have greater exposure to modern values (Kim 1986; Min 2004). Also, because the one child policy was particularly restrictive for the majority Han, it is expected that the Han women will have less son preference. It is assumed women who had a birth before the one child policy would have higher fertility, due to the policy implementations on Chinese women whereas before they had more freedom to have another birth. Wen (1993), Li and Cooney (1993), and Poston (2002a) found that the policy tended to raise the imbalanced SRB in China. The higher the woman's level of education, the fewer her number of ever-born children. This is because educated women are more aware of

women's rights and tend to have more progressive attitudes about son preference (Freedman et al. 1988; Poston 2002a). My dissertation includes three more variables in the U. S. to address race and ethnicity: White, Black, and Hispanic origin (Martin et al. 2005). Then, the dissertation examines if American women have son preference³.

Hypotheses

The major goal of this dissertation, first, is to examine the effect of son preference on fertility in China and South Korea, and the U. S. More specifically, will there be a positive association between the sex of prior-born child and the hazards of having another birth in these countries?

My five specific hypotheses are:

1) *There is a positive association between GIRL1 (whether or not the first child is a daughter) and CHILD1-2 (the instantaneous hazard of having a second birth), controlling for the other independent variables.* In other words, will women with a daughter as their first child, as opposed to a son, will have higher likelihood of having a second birth in China and South Korea, but this relationship should not occur in the U. S.

³ Son preference among Hispanic women will only be examined in the interaction model and a detailed explanation will be given later sections in this chapter.

2) *There is a strong positive association between GIRLS (whether or not the first two children are daughters) and CHILD2-3 (the instantaneous hazard of having a third birth), controlling for other independent variables.* In the second analysis women who have two daughters instead of sons from their previous births are expected to have a higher likelihood of having a third birth in China and South Korea; but no such relationship is expected in the U. S. At this time, however, my dissertation expects the hazard ratios to be higher than in the first analysis, because son preference becomes more obvious in the higher parity.

3) *There is no association between the sex of prior-born child and the hazard of having another birth in the U. S., controlling for other independent variables.* As detailed in the literature review, in a society with no or very minimal son preference such as the United States we do not expect that the sex of the preceding child will influence the likelihood of another birth. In addition, there has been no sex preference detected in the U. S. in terms of SRBs. Thus, my dissertation assumes that the sex of prior born children will not influence the hazard of having higher order birth in the U. S.

4) *The higher the women's education, the effect of son preference on fertility would be less.* My dissertation also attempts to examine the effects of women's status on son preference. If modernization enhances women's status, i. e., women's education, women's education should influence negatively the likelihood of having another birth only for having a son. However, as Croll (2000) argued, there was counter-evidence that modernization and women's education did not work well. Even through successful economic development, son preference in China, South Korea, and other countries was

not reduced or diminished. Thus, my dissertation endeavours to see if the women's status really reduces son preference in China and South Korea. In addition, my dissertation examines its impact by parity. If as hypothesized, son preference gets stronger in higher parities, the impact of women's education on having a third birth might be smaller or have no effect on having a second birth.

5) If Hispanic women with low socioeconomic status have son preference, there will be a positive association between the sex of prior-born child and the hazard of having another birth, controlling for other independent variables. My dissertation attempts to examine son preference and fertility in the U. S. Unger and Molina's study (1997) reported that Hispanic women with low socioeconomic status were more likely to have another birth, if their prior child(ren) was(were) daughter(s). Thus, my dissertation tests this hypothesis.

Hazard Methods

This dissertation employs hazard analysis because the dependent variable is a time-variant variable, that is, whether over time women who have one live birth, or two live births, will have another birth. The main advantage of hazard models is that they can analyze these time-dependent and -independent variables together (Allison 1984; Cleves, Gould, and Gutierrez 2002). As previously mentioned, the dependent variable deals with whether women, who have one live birth, or two live births, will have another birth, and

this will take into account months from the elapsed previous birth to another one. The next section explains in detail the construction of this time-variant variable.

The Construction for Time-Variant Dependent Variable

The survival-time data for Chinese, South Korean, and American women consist of two variables. The first variable is a dummy variable indicating for each woman whether or not the event (the second birth for the first group and the third birth for the second group of Chinese, Korean, and the U. S. women) occurred during the observation period. It (CHILD1-2 or CHILD2-3) is coded 1 if the woman has a second (or third) birth and 0 otherwise. The second is a variable measuring the number of months that have elapsed since the first or the second birth and the conception leading to the next birth or to the censoring event. The survival-time variable is an interval variable (MONTHS1-2 or MONTHS2-3) and reflects the number of months between the date of the last birth and the date of conception leading to the next birth, or between the date of the last birth and the date of the censoring event. The censoring events include such events as the woman reaching the end of childbearing age (AGE45); the woman having a pregnancy after the last birth that ends in a miscarriage or in a stillbirth or in an abortion; the woman becoming sterilized sometime after the last birth; the woman had a child(ren) who died after the live birth, and the date of the survey, September 1997, July to August 2000, January 2002 to March 2003, for China, South Korea, and the U. S., respectively.

Kaplan-Meier (K-M) Survivor Graph

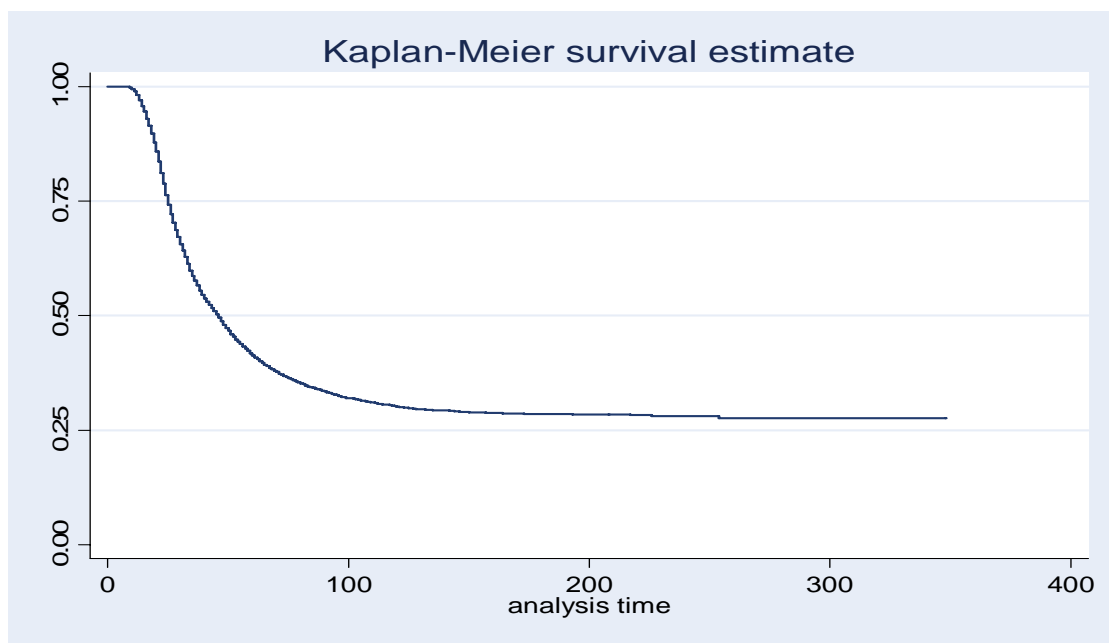
One way to describe the survival-time data for this group of women is to plot their survivor functions (Kaplan & Meier 1958; Hamilton 1998). This curve allows us to see graphically the hazard of having a second and a third birth for each woman in a monthly frame. For the first group of women, let n_t represent the number of women who have not given birth to a second child and are not censored at the beginning of time period t ; d_t represents the number of second children born to these women during time period t . The formula is the Kaplan-Meier estimator of surviving beyond time t (i.e., not having a second birth before time t), and is the product of survival probabilities in t and the preceding periods:

$$(1) S(t) = \pi \prod_{j \leq i} \{(n_j - d_j)/n_j\}$$

Figure 3 is a plot of $S(t)$ against the number of months between the first birth and the conception leading to the second birth in Chinese women. The K-M survivor curve for this first group of Chinese women shows the probabilities of surviving the hazard of having a second birth for each month of analysis time. The curve steps down rapidly from a likelihood of around 100% of surviving the hazard of a conception leading to a second birth just a few months after birth of the first child, to a likelihood of around 35% by about the 100th month. This means that 65% of the Chinese women who had one child had a second birth by the 100th month after their first birth. The curve then levels

off by the 200th month to a likelihood of surviving having a second birth of about 30%. This means that 30% of the Chinese women are not having a second birth.

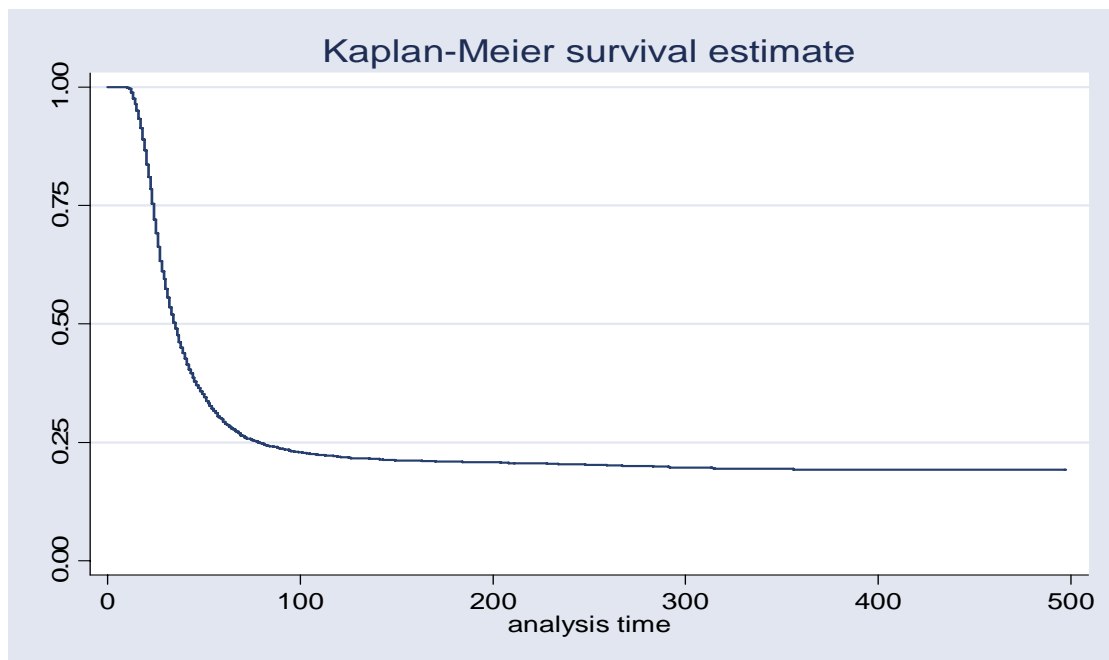
Figure 3. Probability of surviving the hazard of a second birth: China (1997)



In the meantime, the South Korean women in Figure 4 had the likelihood from a first birth to a second birth of around 25% by the 90th month. This levels off by the 150th month to a likelihood of surviving, or having a second birth, of about 20%. In other words, three fourths of the South Korean women who had one child had a second birth

by the 90th month after their first birth, and a total of 80% the South Korean women who had one live birth had a second birth. This means that about 10 percent more South Korean women who had one live birth had a second birth, compared to Chinese women.

Figure 4. Probability of surviving the hazard of a second birth: South Korea (2000)



The U. S. women in Figure 5 had the likelihood from the first birth to a second birth of around 20% by the 150th month. This levels off by the 200th month to a likelihood of surviving, or having a second birth, of about 15%. Four out of five

American women who had one child had a second birth by the 150th month after their first birth, and a total of 95% of the American women who had one live birth had a second birth. Accordingly, the South Korea and the U. S. have steeper curves than China. This demonstrates that women in South Korea and the U. S. have a greater likelihood over time of having a second birth than do women in China.

Figure 5. Probability of surviving the hazard of a second birth: the U. S. (2002)

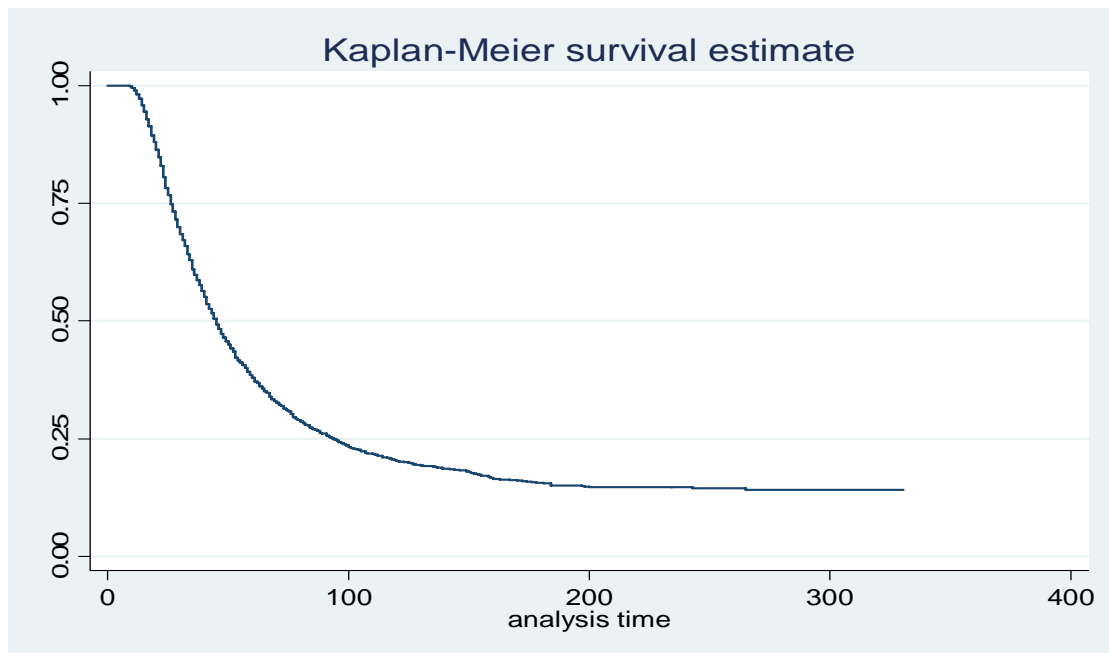


Figure 6 is a plot of the K-M survivor curve for the second group of Chinese women. Their K-M curve does not drop down as fast as in the first group. There is a 95% surviving the hazard of a conception leading to a third birth after the 100th month. This is because very few Chinese women who have two children have a third birth (only 2% of Chinese women who have two live births have a third birth, see Table 9). In Figure 7, we see that South Korean women have a likelihood from second birth to a third birth of around 55% by the 100th month. This curve levels off the 200th month to a likelihood of surviving, or having a third birth, of about 50%. To put it simply, half of the South Korean women who had two children progressed to a third birth. The U. S. women had a likelihood to proceed from the second birth to a third birth of around 40% by the 160th month (see Figure 8). This levels off by the 250th month to a likelihood of surviving, or having a third birth, of about 35%. Almost two thirds of American women had a third birth. Accordingly, South Korean and U. S. women were more likely to have a third birth compared to Chinese women. The highest likelihood of having a third birth for American women makes sense if we take into account the higher American fertility rate. If we take into account the one child policy in China, the lowest likelihood of having a third birth also makes sense to us.

Figure 6. Probability of surviving the hazard of a third birth: China (1997)

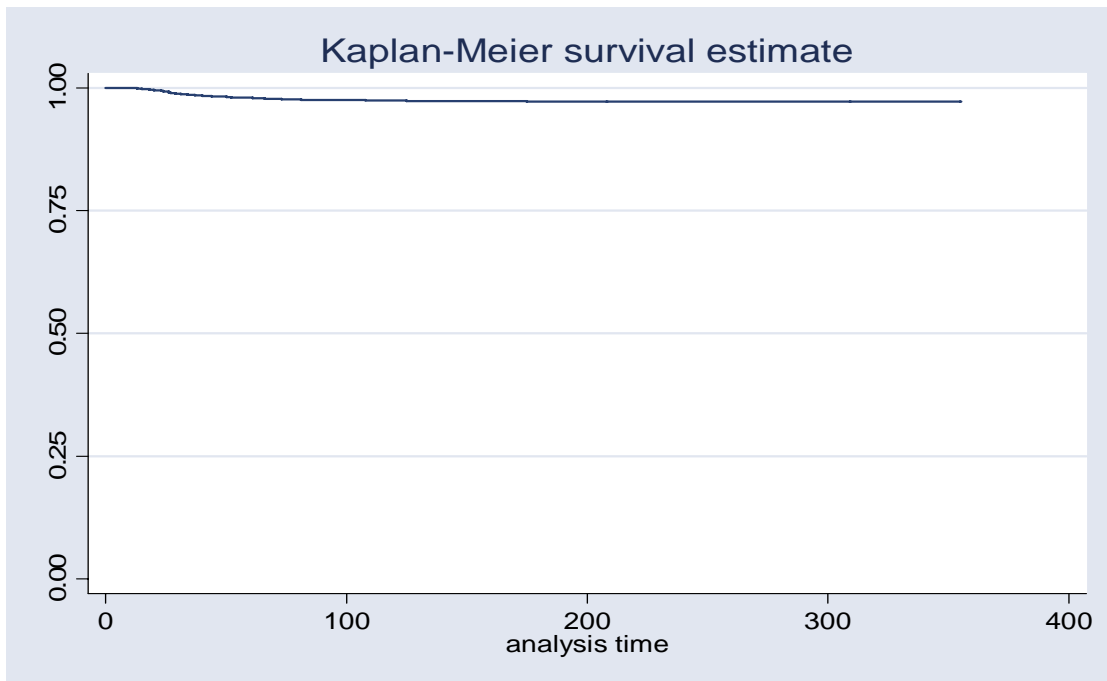


Figure 7. Probability of surviving the hazard of a third birth: South Korea (2000)

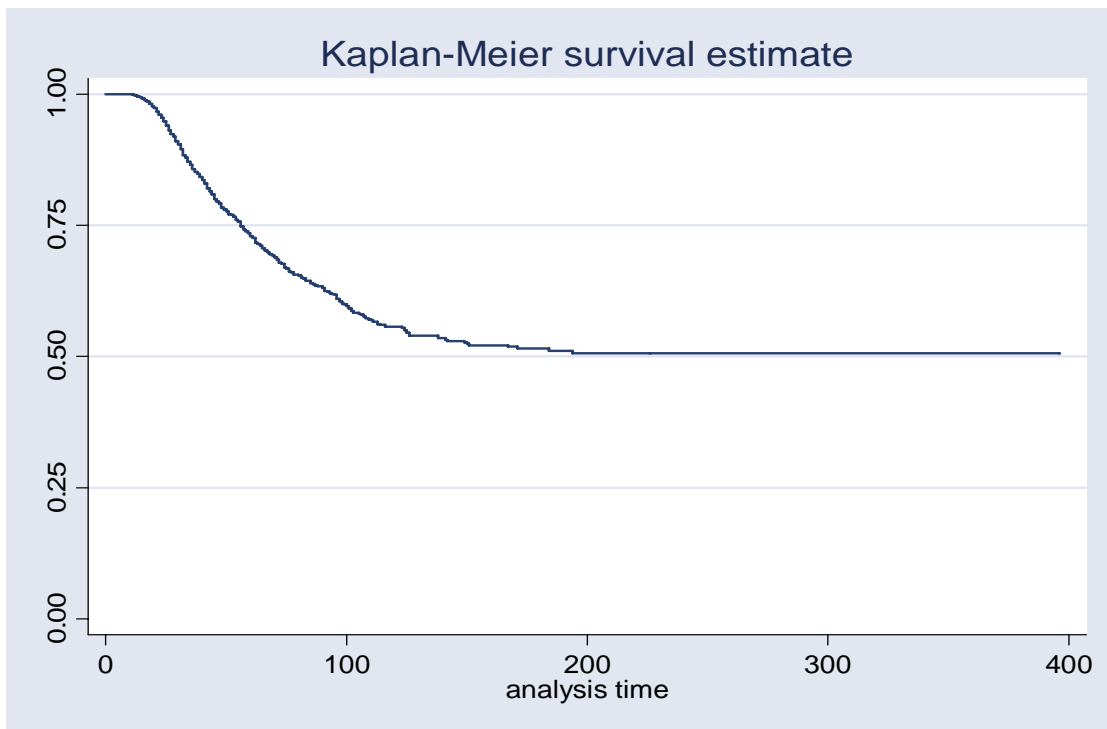
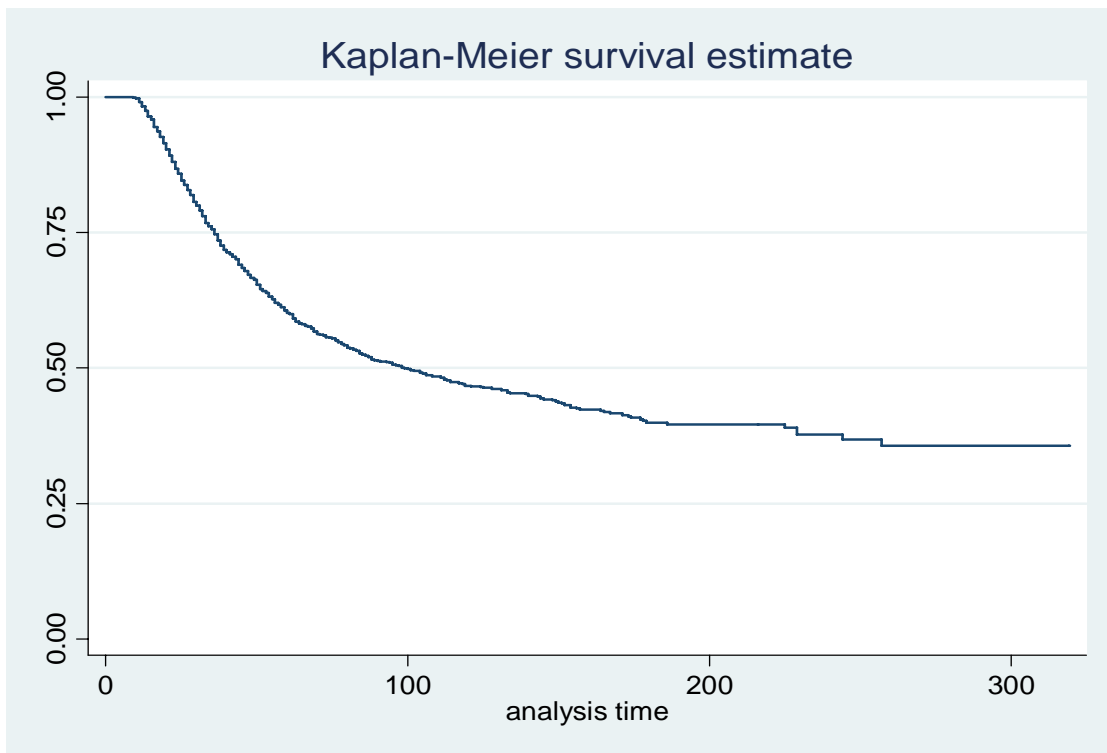


Figure 8. Probability of surviving the hazard of a third birth: the U. S. (2002)



Cox's Partial-Likelihood Method

The Cox's partial-likelihood method is used to estimate continuous time proportional hazards models of the transitions from the first to the second birth and from the second to the third birth. The Cox proportional hazard model assumes the following form when all the independent variables (covariates) are time-independent, that is, when their values do not change over time. This is the situation in all of the analyses in this dissertation.

$$(2) \log h(t) = \log h_o(t) + b_1 x_1 + \dots + b_k x_k.$$

Where $h_o(t)$ is an unspecified function of time t , x_1 to x_k are covariates, and b_o and b_k are parameters to be estimated. In the first analysis, the main covariate of interest is a dummy variable indicating whether the first child is a daughter. In the second analysis it is a dummy variable indicating whether the first two children are daughters. One feature of the Cox model that makes it so attractive is that the function of time does not have to be specified.

The dependent variable is the hazard rate, which is an unobserved value gauging the instantaneous likelihood that a woman will have another birth during the interval since the previous birth (Allison 1984; Yamaguchi 1991).

Thus, for instance, the hazard models for the first group and the second group of China would be the followings⁴.

The first group model:

$$(3) \log h(t) = \log h_o(t) + b_1 x(GIRL1)_1 + b_2 x(AGE-BIRTH1)_2 + b_3 x(HAN)_3 + b_4 x(POLICY1)_4 + b_5 x(ELEMENTARY)_5 + b_6 x(JUNIOR)_6 + b_7 x(HIGH)_7.$$

⁴ The hazard models for other countries are similar to China. As I described earlier in this chapter, there are some differences. For instance, South Korea and the U. S. have a variable, URBAN, but not in China. The U. S. has a race/ethnicity variable such as HISPANIC, WHITE, BLACK, and OTHERS. The reference group for the education variable is different due to different education levels. The second group analysis has variables such as SON-DAUGHTER and DAUGHTER-SON to compare the likelihood of having a third birth based on sex composition of previous children (recall section 3, Measurement).

The second group model:

$$(4) \log h(t) = \log h_o(t) + b_1x(GIRLS)_1 + b_2x(DAUGHTER-SON)_2 + b_3x(SON-DAUGHTER)_3 + b_4x(AGE-BIRTH2)_4 + b_5x(HAN)_5 + b_6x(POLICY2)_6 + b_7x(ELEMENTARY)_7 + b_8x(JUNIOR)_8 + b_9x(HIGH)_9.$$

Interaction Models

Next, this dissertation uses the interaction variables. Often, researchers expect casual relationships between dependent and independent variables. In other words, we assume that a variable, X, has a direct cause on another variable, Y. The relationship between X and Y, however, may be moderated by a third variable. The nature of the relationship between X and Y varies, depending on the value of Z. Researchers call this kind of relationship an interaction effect (Jaccard and Turrisi 2003).

This dissertation expects that women's education influences the relationship between the sex of previous child and having another birth. According to prior studies, the more educated women, the fewer children they have. In this regard, scholars also assume the more educated women may have lower or no son preference. However, this is not convincing because son preference is often sustained even with successful economic development and the significant enhancement of women's status. Yet, there is no empirical evidence about this. If women's education really reduces son preference, women with more education are less likely to have another birth even if they have a daughter or daughters as their previous child or children. Hence, my dissertation

includes the interaction variable, GIRL1-EDUCATION for the first analysis and GIRLS-EDUCATION for the second analysis, in China and in South Korea. The first interaction variable refers to the interaction between women who had a daughter and their educational attainment, and the second refers to the interaction between women who had two daughters and their educational attainment. If the argument this dissertation develops is valid, the coefficients for those interaction terms should be negative and statistically significant.

The interaction model for the U. S. is different from the others. Because only Hispanic women with low socioeconomic status have been reported to have son preference (Unger and Molina 1997), the interaction variable for the U. S. are mixed with the sex of previous child and the poverty, not women's education. If this is correct, poor Hispanic women who had a daughter or daughters should be more likely to have another birth in order to have a son. Thus, my dissertation constructs the interaction variable, GIRL1-POVERTY for the first group, which refers to the interaction between women who had a daughter and were in poverty, GIRLS-POVERTY for the second group, which refers to the interaction between women who had two daughters and were in poverty. Thus, the U. S. analyses only use Hispanic women in an attempt to test Unger and Molina's hypothesis. If Unger and Molina's argument is valid, the coefficients for GIRL1-POVERTY and GIRLS-POVERTY should be positive and statistically significant.

The equation for the Cox's partial-likelihood method with an interaction variable is the following:

$$(5) \log h(t) = \log h_o(t) + b_1x_1 + b_2x_2 + b_3x_1x_2 + \dots + b_kx_k.$$

Notice that $b_3x_1x_2$, which represents the interaction, is the only difference between the equation with the interaction variables and the equation without. Thus, the hazard models for the first group and the second group of China and South Korea would be the following⁵.

The first group model:

$$(6) \log h(t) = \log h_o(t) + b_1x(GIRL1)_1 + b_2x(AGE-BIRTH1)_2 + b_3x(HAN)_3 + b_4x(POLICY1)_4 + b_5x(ELEMENTARY)_5 + b_6x(JUNIOR)_6 + b_7x(HIGH)_7 + b_8x(GIRL1-EDUCATION)_8.$$

The second group model:

$$(7) \log h(t) = \log h_o(t) + b_1x(GIRLS)_1 + b_2x(DAUGHTER-SON)_2 + b_3x(SON-DAUGHTER)_3 + b_4x(AGE-BIRTH2)_4 + b_5x(HAN)_5 + b_6x(POLICY2)_6 + b_7x(ELEMENTARY)_7 + b_8x(JUNIOR)_8 + b_9x(HIGH)_9 + b_{10}x(GIRLS-EDUCATION)_{10}.$$

⁵ The interaction models among countries are different as in the model without interaction variable.

This chapter has described the data and methods used in this dissertation. In addition, the chapter discussed the measurement and hypotheses. The next chapter presents the descriptive statistics and the results of the analyses for each group for the three countries.

CHAPTER IV

RESULTS FROM THE FIRST GROUP OF ANALYSES: THE TRANSITION FROM THE FIRST BIRTH TO THE SECOND BIRTH

Chapter IV presents the results from the first group of analyses that model the transition of women from one live birth to the second live birth. The descriptive statistics are presented first, and then the results of the hazard analyses. Two different sets of hazard analyses are conducted. The first series of analyses are the hazard of having a second birth for Chinese, South Korean, and American married women with one live birth. The results also include the semi-standardized hazard ratios to distinguish the relative impacts of the covariates on the hazard of having a second birth. The second series of hazard analyses are the interaction models to observe the impacts of women's education on the hazard of having a second birth for women from China and South Korea. For U. S. women, the interaction model examines the impact of being a poor Hispanic woman on the hazard of having a second birth. The next section presents the descriptive statistics for each country, China, South Korea, and the U. S., respectively.

Descriptive Statistics

Among the 11,157 Chinese women with one live birth, 62 percent of them reported having a second birth (see Table 1) (CHILD1-2). The mean duration time at

risk of the hazard of having a second birth was 59 months. However, one should keep in mind that this duration time also includes censoring for women who did not have a second birth during the survey period. Almost half of the first births of Chinese women were females (GIRL1). On average, the mothers were 23 years old when they had their first birth (AGE-BIRTH1). Over 90 percent of the Chinese women were the Han. One out of four women had their first birth before the one child policy, which was implemented in 1979. Slightly over one in four Chinese women had no formal education, and were thus illiterate. One out of three had an elementary school education. Twenty eight percent of the Chinese women had a junior high education, and only 13 percent had high school or more education.

Among the 5,819 South Korean women, 73 percent of those who had one live birth had a second birth. This was 11 percent more than that for Chinese women. This was likely due to South Korea's lack of a compulsory policy such as in China. In addition, South Koreans have more resources to support their children due to their advanced economic level. They had an average of 69 months of duration time at risk of experiencing the hazard of a second birth. South Korean women had 10 months more risk period compared to the Chinese women. Almost half of the first children of South Korean women were daughters (49%), and this was similar to the pattern of Chinese women. The average age at the first birth was 26 years old, which was 3 years older than that for Chinese women. Over three fourths of the South Korean women lived in urban areas. A total of 14 percent of them had an elementary education; 18 percent a junior high education; 47 percent a high school education; 20 percent a college or more

education. South Korean women had more education than the Chinese women; no South Korean women were illiterate.

Among the 3,151 American women, over two thirds had a second birth, which was similar to South Korean women. American women had an average 60 months duration of risk of the hazard of a second birth. The duration time of American women was close to that for Chinese women. One half of their first births was female. The average age at the first birth was 23 years old, the same as the Chinese women.

The Korean women were the oldest among the three groups of women at first birth. Perhaps this reflects the delayed marriage of South Korean women. Even the age at their first marriage for South Korean women was the oldest: the average age at first marriage for a female in South Korea was 26 years of age, 23 for Chinese women, and 24 for U. S. women. Most American women (84%) lived in the metropolitan areas. American women had the highest level of education among the three groups of women. All American women had at least a junior high school education. More than one out of ten American women (12%) completed a junior high school education, 35 percent a high school education, and over half of American women completed college and more. Around one out four American women had Hispanic origin (24%); over a half of them were White (56%); 15 percent of them were Black; only 5 percent of them indicated other.

The Results of the Hazard Analyses

Tables 2 to 4 report the Cox proportional hazard estimates of the effect of the presence of a daughter, along with the control covariates, on the hazard of having a second birth for Chinese, South Korean, and the U. S. married women with one live birth. The most important result in Tables 3 to 5 is the positive hazard coefficient for the GIRL1 variable in China and South Korea, which suggests the importance of son preference. The U. S. model does not show a significantly positive coefficient for the GIRL1 variable.

China

Among married Chinese women the variable GIRL1 has a coefficient of 0.25 (see Table 2). This means that Chinese women whose first child was a daughter have a significantly higher likelihood of going on to have a second birth than do women whose first child was a son.

Another way to interpret the coefficient is by exponentiating it to a hazard ratio (Cleves, Gould, and Gutierrez 2002:115), which allows for easier interpretation. If the values of the hazard coefficients are exponentiated, that is, their antilogs are taken, hazard ratios are obtained.

Table 1. Descriptive statistics for the first group, women who had one live birth

		China (1997)		South Korea (2000)		The U. S. (2002)		
Total		11,157		5,819		3,151		Cases
Child1-2	(yes=1)	61.5		73.4		71.6		%
Duration1		58.6	min.:9; Max.:348	68.5	min.:9; Max.:497	60.3	min.:9; Max.:330	Mean
Girl1	(yes=1)	49.1		49.3		49.8		%
Urban	(yes=1)	-		75.1		83.6		%
Han	(yes=1)	90.7		-		-		%
Age-Birth1		23.2		25.8		23.4		Mean
Hispanic	(yes=1)	-		-		24.0		%
White	(yes=1)	-		-		56.3		%
Black	(yes=1)	-		-		15.1		%
Others	(yes=1)	-		-		4.6	*	%
Policy1	(yes=1)	25.0		-		-		%
Illiterate	(yes=1)	26.0	*	-		-		%
Elementary	(yes=1)	32.7		14.4	*	-		%
Junior	(yes=1)	28.4		18.4		12.2	*	%
High	(yes=1)	12.9		47.0		35.4		%
College	(yes=1)	-		20.2		52.5		%

* Reference Group

These exponentiated coefficients may be interpreted as follows: for each unit increase in the covariate, the hazard is multiplied by its exponentiated coefficient. Thus, if $100(e^b - 1)$ is computed, the percentage change in the hazard with each one unit change in the explanatory variable is obtained.

For instance, GIRL1 has a hazard ratio among the Chinese women of 1.29. This means that among married Chinese women, having a daughter as the first child instead of a son increases the hazard of having a second birth by 29 percent, or $[100(1.29 - 1 = 0.29)] = 29$. The hazard coefficient and the hazard ratio for GIRL1 indicate a sizable and significant positive effect of having a daughter on the hazard, or likelihood, of experiencing the transition to a second birth.

The results in the Cox model of the control covariates confirm what this dissertation expected. The older the Chinese women when she had her first birth, the less likely she was to experience the hazard of having a second birth. For every additional one year of age at the birth for her first child, the hazard of having a second birth was decreased by 10 percent. Han women were less likely to have a second birth compared to minority women. For Han women, the hazard of having a second birth was decreased by 10 percent. The policy impact was significant and substantial. Women who had their first birth before the one child policy implementation were 105 percent more likely to have a second birth. The more educated Chinese women have a lower likelihood of having a second birth compared to illiterate women. The hazard of having a second birth was decreased by 2 percent among women who have an elementary education. The hazard of having a second birth was decreased by 7 percent among women who have a

junior high school education. The hazard of having a second birth was 16 percent decreased among women with a high school education.

Table 2. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, on the hazard of having a second birth: 11,157 married women, aged 15-45, with one live birth (China, 1997)

	Hazard		Z-Score	Hazard	Semi-standardized Hazard
	Coefficient			Ratio	Ratio
Girl1	0.25	*	10.53	1.29	1.13
Han	-0.11	**	-2.60	0.90	0.97
Age-Birth1	-0.10	*	-23.26	0.90	0.74
Policy1	0.72	*	28.03	2.05	1.37
Elementary	-0.02		-0.86	0.98	0.99
Junior	-0.08	*	-3.76	0.93	0.95
High	-0.17	*	-6.44	0.84	0.91
Final log likelihood	-60374.274				
Likelihood ratio χ^2	1841.52*				

Note: * $p < .001$; ** $p < .01$

South Korea

South Korean women had a 1.25 hazard ratio of having a second birth when they had a girl as their first birth (see Table 3). This means that women who had a girl as their

first child are 25 percent more likely to have a second child compared to women who had a son as their first child. This hazard ratio is almost the same as that for Chinese women, who are 29 percent more likely to have a second child if they have a girl as their first child. Older South Korean women also have a lower likelihood of having a second child.

With respect to the effects of residence, my dissertation expects that if a woman lives in an urban area, she may have a less traditional conception of fertility and son preference, compared to a woman living in a rural area. The hazard of having a second child for urban South Korean women supports this hypothesis. Urban dwellers have an 11 percent lower likelihood of having a second birth. Also, my dissertation expects that increases in women's education should be negatively associated with the likelihood of experiencing the transition to a second birth. Interestingly, this hypothesis is supported for China, but not for South Korea. As Cho and Ahn (1993) argued, sometimes the education variable is associated in a positive way among Korean women. Financial resources as well as traditional values may mediate the path between birth and education. The educated women will have greater resources, and they are more likely to have another birth given the low fertility situation (recall the TFR of South Korea was 1.1 in 2005, giving South Korea the world's lowest fertility rate). Scholars also take notice of the high costs of childrearing as one of the reasons for low fertility (Kim et al. 2001). Thus, it may be that having a second child is linked with economic considerations. The more educated women may have higher-paying jobs and the option

to marry more educated men who also may have higher-paying jobs, which allows those women to have a second birth.

Table 3. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, on the hazard of having a second birth: 5,819 married women, aged 15-45, with one live birth (South Korea, 2000)

	Hazard Coefficient		Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girl1	0.22 *		6.89	1.25	1.12
Age- Birth1	-0.06 *		-12.17	0.94	0.82
Urban	-0.11 **		-3.09	0.89	0.95
Junior	0.24 *		4.05	1.28	1.10
High	0.46 *		9.03	1.58	1.26
College+	0.55 *		9.77	1.74	1.25
Final log likelihood	-33972.544				
Likelihood ratio χ^2	309.06*				

Note: * $p < .001$; ** $p < .01$

The United States

As expected, the coefficient for GIRL1 for the U. S. women is not significant (see Table 4). This means that the U. S. women whose first child was a daughter are no

more likely to have a second birth than women whose first child was a son. This result supports the notion that American women do not have son preference.

Only three variables among the covariate controls, namely, AGE, HIGH, and COLLEGE are significant, as expected. The older a U. S. woman is when she has her first birth, the less likely she is to experience the hazard of having a second birth. American women with a high school or college education have a lower likelihood of having a second birth compared to women with a junior high school education. Race and ethnicity are not statistically significant.

Table 4. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, on the hazard of having a second birth: 3,151 married women, aged 15-45, with one live birth (The U. S., 2002)

	Hazard Coefficient	Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girl1	-0.04	-0.79	0.96	0.98
Age-Birth1	-0.02 *	-3.70	0.98	0.90
Urban	-0.09	-1.19	0.92	0.97
White	0.18	1.55	1.20	1.10
Black	0.07	0.49	1.07	1.02
Hispanic	0.20	1.61	1.22	1.09
College+	-0.20 ***	-2.19	0.82	0.91

Final log likelihood -17056.014

Likelihood ratio χ^2 37.52*

Note: * p<.001; ** p<.01; *** p<.05

Semi-Standardized Hazard Ratios

Next, I constructed semi-standardized hazard ratios to examine the relative impacts on the second birth of the various covariates. To do this, I raised the hazard ratio of each covariate to the power of one standard deviation (Rabe-Hesketh and Everitt 2000: 155). The semi-standardized hazard ratios indicate that the most influential covariate in China is POLICY. Of the seven covariates, the GIRL1 variable in China is the second most influential (see Table 2). The GIRL1 variable in the South Korea model is the third most influential among the other six controlling covariates (see Table 3). Accordingly, the sex of the previous child is indeed influential in having a second birth, but was not the most influential factor.

The Results of the Interaction Models

The following discussion reports results for the interaction models for each country. As described before, scholars have argued that son preference is related to gender inequality. A society with higher gender inequality has a stronger son preference than a society with lower gender inequality (Rindfuss and Brewster 1996; Brewster and Rindfuss 2000). One of the gender status indicators is women's education. Scholars have assumed that women with more education should show lower son preference, because

they are more modernized and had non-traditional values compared to women with less education. If this argument is accurate, the relationship between the hazard of having a second birth and the sex of the previous child should be influenced by women's educational attainment. In fact, it appears that women's education does have an effect on fertility. But there is no research specifically focused on the impact of women's education on son preference. Thus, this dissertation includes an interaction variable between women's education and the sex of the previous child to examine its impact. If the argument holds, the coefficient of the interaction variable should be negative and significant.

China and South Korea

The results show that even if the models included the interaction variable, the coefficients for GIRL1 in China and South Korea still had significantly positive coefficients and indeed were stronger compared to the models without the interaction variable. For instance, Chinese women who had a girl as their first child were 39 percent more likely to have a second child instead of women who had a son as their first child (see Table 5) (recall the hazard ratio for GIRL1 without the interaction variable was 1.29). Other covariates in China were also significant and supported the hypotheses as in the model without the interaction variable. The interaction variable (GIRL-EDUCATION), which was the most important variable in this interaction model, supported the hypothesis: women who had more education and a daughter as their first

child had a lower hazard ratio of having a second birth: 3 percent were less likely to have a second birth.

Table 5. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, including the interaction variable, on the hazard of having a second birth: 11,157 married women, aged 15-45, with one live birth (China, 1997)

	Hazard Coefficient		Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girl1	0.33 *		7.58	1.39	1.18
Han	-0.10 **		-2.45	0.90	0.97
Age-Birth1	-0.10 *		-23.24	0.90	0.74
Policy1	0.72 *		28.09	2.06	1.37
Elementary	-0.02		-1.15	0.98	0.99
Junior	-0.07 **		-3.16	0.94	0.96
High	-0.15 *		-5.45	0.86	0.92
Girl-Education	-0.03 *		-2.11	0.97	0.96
Final log likelihood			-60372.043		
Likelihood ratio χ^2			1845.98*		

Note: * $p < .001$; $p < .01$

The South Korea model also displayed the same results (see Table 6). The hazard ratio for GIRL1 became larger, 2.02, and the other covariates showed the same results as

in the model without the interaction variable. The coefficient for the interaction variable, GIRL-EDUCATION, showed a negative relationship with statistical significance. Women who had a daughter with more education were 1 percent less likely to have a second birth.

Consequently, the interaction models for both countries confirmed that enhancing women's education tends to reduce son preference, even though the amount of its impacts was not large.

Table 6. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, including the interaction variable, on the hazard of having a second birth: 5,819 married women, aged 15-45, with one live birth (South Korea, 2000)

	Hazard Coefficient		Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girl1	0.70 *		7.35	2.02	1.42
Age-Birth1	-0.06 *		-11.93	0.94	0.81
Urban	-0.11 **		-3.09	0.89	0.95
Junior	0.29 *		4.79	1.34	1.12
College+	0.81 *		10.76	2.24	1.38
Girl-Education	-0.01 *		-5.40	0.99	0.83
Final log likelihood			-33957.838		
Likelihood ratio χ^2			322.66*		

Note: * $p < .001$; ** $p < .01$

Semi-standardized hazard ratios in the interaction models in South Korea showed interesting results. In China, they indicated the same results as in the model without the interaction variable (the most influential covariate in China was still POLICY and the GIRL1 variable was the second most influential one). However, the GIRL1 variable in South Korea became the most influential among the six covariates in the interaction model (recall this variable was the third most influential in the model without the interaction variable). This suggests that the most important reason to have a second birth for South Korean women was the sex of their previous child if we take into account the mediating impact of women's education. Another thing to be considered is that South Korea has the lowest low fertility rate in the world, which implies that women who want another child should have a reason for this, such as son preference.

The United States

As already described, the interaction model for the U. S. is different from those for the other two countries. An important argument from the literature on American son preference is whether it is present among Hispanic women with low socioeconomic status. Hispanic women in poverty have been shown to have a higher likelihood of having a second or a third birth if their previous child(ren) was(were) a daughter(s), according to Unger and Molina (1997). Their study, however, was not based on a representative sample. Thus, my dissertation examines if their argument holds when

nationally representative data are used. If women are in poverty and of Hispanic origin, and if their previous child(ren) were daughter(s), will those women have a higher hazard ratio of having another birth compared to Hispanic women with a son(s) as their previous birth(s)? To answer this question, I first selected only Hispanic women from the data among women with one live birth. Then, I included an interaction variable between the sex of the previous child and the poverty.

The sample size in the interaction model was significantly changed from 3,151 to 757 after selecting only the Hispanic women (see Table 7). Descriptive statistics for the interaction model were somewhat different from the model without the interaction variable. Hispanic women had a higher percentage having a second birth, 78%, which is 6 percent higher than that for women in all American women model. An average duration time at risk from the first birth was around 7 months shorter than that in the all American women model. Age at first birth among Hispanic women was one year younger than that in the all American women model. Education level was significantly lower for Hispanic women, who generally have less education (Macionis 2007:537). Over 70 percent of the Hispanic women had a junior high or a high school education (recall that over half of American women had college or more education, in the model without the interaction variable). A total of 38 percent of Hispanic women were in poverty. Among them, around one out of five Hispanic women had a daughter as their previous child and were in poverty (19%).

**Table 7. Descriptive statistics for the interaction model:
U. S., women who had one live birth**

The U. S. (2002)			
Total		757	Cases
Child1-2	(yes=1)	77.5	%
Duration1		52.5 min.:9; Max.:294	Mean
Girl1	(yes=1)	50.9	%
Urban	(yes=1)	93.8	%
Age-Birth1	(yes=1)	22.0	Mean
Junior	(yes=1)	30.5 *	%
High	(yes=1)	36.9	%
College	(yes=1)	32.6	%
Poverty	(yes=1)	36.7	%
Girl1-Poverty	(yes=1)	18.6	%

* Reference Group

The U. S. interaction model showed there was no significant relationship between the sex of the previous child and other covariates except age at birth (see Table 8). Older Hispanic women had a lower hazard of having a second birth. In addition, the interaction variable, GIRL1-POVERTY, was not significant. Hence, we do not accept the hypothesis that poor Hispanic women who had a daughter as their first child were more likely to have a second birth. Accordingly, Unger and Molina's argument (1997) was not supported for this first group of Hispanic women who had one live birth.

Table 8. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, including the interaction variable, on the hazard of having a second birth: 757 married women, aged 15-45, with one live birth (The U. S., 2002)

	Hazard Coefficient		Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Gir11	-0.06		-0.49	0.94	0.97
Age-Birth1	-0.03	**	-2.64	0.97	0.87
Urban	-0.15		-0.98	0.86	0.96
High	-0.21		-1.67	0.81	0.90
College+	-0.22		-1.74	0.80	0.90
Poverty	0.27		1.67	1.31	1.11
Gir11-Poverty	0.06		0.29	1.06	1.03
Final log likelihood	-3420.711				
Likelihood ratio χ^2	26.17*				

Note: * $p < .001$; ** $p < .01$

This chapter has presented descriptive statistics and the results of hazard analyses from the first group: women who had one live birth. The results supported the hypotheses that Chinese and South Korean women were more likely to have a second birth if their first child was a daughter. However, this hypothesis was not supported for U. S. women. In addition, this chapter also analyzed models with the interaction

variables to examine the mediating impact on son preference. For China and South Korea, women's education indeed tended to reduce son preference, but its impacts were not large. For U. S. women, Hispanic women with low socioeconomic status were not likely to have a second birth. The next chapter presents the descriptive statistics and the results of the analyses for women with two live births.

CHAPTER V

RESULTS FROM THE SECOND GROUP OF ANALYSES: THE TRANSITION FROM THE SECOND BIRTH TO THE THIRD BIRTH

Chapter V presents the results from the second group of analyses, specifically the model of the transition of women from two live births to the third live birth. This chapter allows us to understand son preference and fertility better. As described in the literature review chapter, the imbalanced SRBs became larger in the higher parity for both China and South Korea. This implies that women who had two daughters instead of two sons have a stronger desire for having a son, which leads them to be much more likely to have a third birth. This chapter presents the descriptive statistics first, and then, the results of the hazard analyses. Also, the same series of hazard analyses are conducted: the first series of analyses are the hazard of having a third birth for those Chinese, South Korean, and the U. S. married women with two live births. The results include the semi-standardized hazard ratios to distinguish the relative impacts of the covariates on the hazard of having a third birth. The final series of hazard analyses are the interaction models to observe the impacts of women's education on the hazard of having a third birth for China and South Korea, and of Hispanic women in poverty. The interaction models for China and South Korea show us that the impact of women's education on son preference and fertility continue to hold into the third birth.

Descriptive Statistics

Among the 6,882 married Chinese women with two children, only 2 percent of them reported having a third birth (see Table 9) (CHILD2-3). There were a lower percentage of third births because of the strong impact of the one child policy. When the policy was first implemented, only some minorities who live in rural area could have a third birth (Bongaarts and Greenhalgh 1985). The majority, the Han, were not allowed to have three children. A mean duration time of risk of having a third birth was around 91 months, which was almost three years longer than for the second birth, and the longest among the three countries. With regard to the sex composition of the women's first two births, 22 percent had two girls (GIRLS), 30 percent had a girl and a boy (DAUGHTER-SON), 24 percent had a boy and then a girl (SON-DAUGHTER), and 24 percent had two sons (SONS). These women were, on average, 26 years old when they had their second child (AGE-BIRTH2). That was 3 years older than at their first birth. The values of other control variables such as whether they are Han or not, and their educational attainment were similar to those of the first group. Over 90 percent of the women were from the majority group of Han. Almost two thirds of the women (63%) completed an elementary or a junior high school education. Twenty-seven percent had no formal education and only one out of ten Chinese women (10%) had a high school or more education.

Among the 3,972 South Korean women, around one out of five (19%) who had two live births, also had a third birth. Taking into account the currently low fertility rate

in South Korea, having three children is not usual. On average each woman had a duration of 49 months between the last birth and the conception leading to the next birth or the censoring event. This interval is almost half of the Chinese interval, and 20 months shorter than that of the second birth for South Korean women. South Korean women seemed to finish their childbearing more quickly after their marriage compared to Chinese women. This occurs perhaps because they married at a later age (recall that age at first birth for Chinese women was 23 years and, 26 years for South Korean women). In addition, their average age at their second birth was 28 years, just two years after they had a first birth. This illustrates that even though some women had their second birth after age 30, most South Korean women tend to finish their childbearing before age 30 (Kim et al., 2001). A total of 26 percent had two girls as their two previous children, 26 percent of them had a girl and a boy, 23 percent of them had a boy and a girl, and 25 percent of them had two sons. Three out of four South Korean women live in urban areas. Educational attainment for the second group showed a similar pattern as the first group where about 12 percent completed an elementary education, 19 percent a junior high school education; half of the South Korean women completed high school, and one out of five South Korean women (20%) completed college or more.

Among the 2,180 American women, nearly half of them (45%) who had two live births also had a third birth. This was the highest rate of the three countries. This makes sense if we take into account the relatively high fertility rate of the U. S. compared to the other countries. The 2005 TFR of the U. S. was 2.0, China was 1.6, South Korea was 1.1 (Population Reference Bureau, <http://www.prb.org/pdf06/06WorldDataSheet.pdf>). On

the average each woman had a duration of 71 months between the last birth and the conception leading to the next birth or the censoring event. The duration for the U. S. was in the middle of the three countries. Their average age at their second birth was 26 years old, which was three years after they had a first birth. The age at second birth for the U. S. women was close to that for the Chinese women. A total of 26 percent of the American women had two daughters as their first two children, 27 percent had two sons, 24 percent had a girl and a boy, or a boy and a girl, respectively. The educational attainment for the second group also showed a similar pattern as in the first group. A total of 15 percent completed a junior high education, 37 percent completed a high school education, and almost half of them completed a college or more education. As to ethnicity, the results also showed a similar pattern as in the first group. One out of four American women (26%) was Hispanic, 54 percent were White, 16 percent were Black, and 5 percent of them indicated other.

Table 9. Descriptive statistics for the second group, women who had two live births; China 1997, South Korea 2000, and U. S. 2002

		China (1997)		South Korea (2000)		The U. S. (2002)	
Total		6,882		3,972		2,180	
Child2-3	(yes=1)	1.8		18.8		44.6	%
Duration2		90.8	Min.:9; Max.:355	48.5	Min.:9; Max.:396	70.8	Min.:9; Max.:319
Sons	(yes=1)	24.2	*	24.5	*	26.5	*
Girls	(yes=1)	22.4		26.2		25.5	
Daughter-Son	(yes=1)	29.9		26.4		24.3	
Son-Daughter	(yes=1)	23.5		22.9		23.8	
Urban	(yes=1)	-		75.0		82.9	
Han	(yes=1)	90.4		-		-	
Age-Birth2		25.5		28.2		26.0	
White	(yes=1)	-		-		25.6	
Black	(yes=1)	-		-		53.7	
Hispanic	(yes=1)	-		-		16.2	
Others	(yes=1)	-		-		4.5	*
Policy2	(yes=1)	27.1		-		-	
Illiterate	(yes=1)	27.4	*	-		-	
Elementary	(yes=1)	34.6		11.7	*	-	
Junior	(yes=1)	28.1		18.9		14.5	*
High	(yes=1)	9.9		49.8		37.1	
College+	(yes=1)	-		19.6		48.4	

* Reference Group

The Results of the Hazard Analyses

Tables 10 and 12 show the results of the Cox proportional hazard models of having a third birth for the three countries. Overall, all models for the three countries are statistically significant, and the results strongly support the hypotheses for China and South Korea. Chinese and South Korean women who already have two daughters have a much higher hazard ratio compared to that of the first group. However, Hispanic women with poverty and daughters as their prior children did not show any relationship with the hazard of having a third birth.

China

The variable GIRLS in Table 10 have a hazard ratio among the Chinese women of 3.79. Among married Chinese women, having two daughters as their previous children instead of having two sons increased the hazard of having a third birth by close to three times (279%). It is considerably higher than the hazard ratio for GIRL1 and implies that imbalanced SRBs became larger in the higher parity. We can assume the desires for having a son for women who already have two daughters in the third birth should be very high. If we take into account the one child policy and the current low fertility in China, having third children does not happen commonly and may well occur for a strongly persuasive reason, e. g., having a son for lineage.

Other control covariates also support the hypotheses as in the first model. For instance, Chinese women who already had two daughters before the policy implementation have nearly two times higher likelihood of having a third birth (183%). The policy impact is thus significant and substantial in the second group. The more educated Chinese women have a lower likelihood of having a second birth compared to illiterate women. For women with an elementary education, the hazard of having a third birth is decreased by 65 percent. Women with junior high education were decreased by 75 percent and women with high school or more education were decreased by 93 percent.

Table 10. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, on the hazard of having a second birth: 6,882 married women, aged 15-45, with two live births (China, 1997)

	Hazard Coefficient	Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girls	1.33 *	5.48	3.79	1.74
Daughter-Son	-0.12	-0.44	0.89	0.95
Son-Daughter	0.04	0.14	1.04	1.02
Han	-0.45	-1.81	0.64	0.88
Age-Birth2	0.02	0.81	1.02	1.08
Policy2	1.04 *	5.48	2.83	1.59
Elementary	-1.04 *	-4.90	0.35	0.61
Junior	-1.40 *	-5.36	0.25	0.53
High	-2.64 *	-3.65	0.07	0.45
Final log likelihood	-1002.0647			
Likelihood ratio χ^2	132.56*			

Note: * p<.001

South Korea

For South Korean women, the hazard ratio for having a third birth is 4.90 (see Table 11). That means that women who already have two daughters as their previous children are almost five times more likely to have a third child compared to women who have two sons as their previous children. This hazard ratio is even higher than that of Chinese women. It confirms that South Korean women also have very strong son preference for their third birth, as do Chinese women.

Other covariates show similar results as the first group. The older women have a lower likelihood of experiencing the hazard. Urban dwellers also have a lower hazard. The education variable in the second model now turns negative as expected. The more education women have lower hazard ratios of having a third birth. For instance, women with high school education, and college or more are between 41 to 40 percent less likely to have a third birth. Educated women generally have low fertility rates; thus, having a third birth for educated women is not common.

Table 11. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, on the hazard of having a second birth: 3,972 married women, aged 15-45, with two live births (South Korea, 2000)

	Hazard		Z-Score	Hazard	Semi-standardized
	Coefficient			Ratio	Hazard Ratio
Girls	1.59	*	12.94	4.90	2.01
Daughter-Son	0.16		0.99	1.17	1.07
Son-Daughter	0.47	**	3.18	1.61	1.22
Age-Birth2	-0.13	*	-10.09	0.88	0.66
Urban	-0.06	*	-0.68	0.94	0.97
Junior	-0.19		-1.51	0.82	0.93
High	-0.52	*	-4.35	0.59	0.77
College+	-0.51	**	-3.27	0.60	0.82
Final log likelihood			-4821.2764		
Likelihood ratio χ^2			510.22*		

Note: * $p < .001$; ** $p < .01$

The United States

Again, the results from the U. S. model confirm the hypothesis that there is little son preference in the United States. For instance, as expected, the coefficient of GIRLS for the U. S. was not statistically significant at all (see Table 12). This means that American women who have two daughters as their previous children are not significantly different from women with two boys with regard to the hazard of a third birth.

Only the AGE variable among the other covariates is statistically significant. The older the U. S. woman is when she has her second birth, the less likely she is to experience the hazard of having a third birth. Also, race and ethnicity do not appear to be significantly associated with the hazard of having a third birth.

Table 12. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, on the hazard of having a second birth: 2,180 married women, aged 15-45, with two live births (The U. S., 2002)

	Hazard Coefficient	Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girls	-0.08	-0.73	0.92	0.96
Daughter-Son	-0.27	-1.97	0.77	0.89
Son-Daughter	-0.14	-1.07	0.87	0.94
Age-Birth2	-0.07 *	-6.08	0.93	0.69
Urban	-0.01	-0.11	0.99	1.00
White	0.29	1.20	1.34	1.16
Black	0.28	1.08	1.32	1.11
Hispanic	0.38	1.54	1.47	1.18
Junior	-0.09	-0.67	0.92	0.96
College+	-0.16	-1.11	0.85	0.92
Final log likelihood	-7098.4798			
Likelihood ratio χ^2	72.25*			

Note: * $p < .001$

Semi-Standardized Hazard Ratios

In this dissertation, I also constructed semi-standardized hazard ratios for each country so to be able to examine the relative impact on the third birth of the various covariates. The semi-standardized hazard ratios for China and South Korea indicate that the most influential covariate is GIRLS, which is a good sign for the hypotheses. The semi-standardized hazard ratios for GIRL1 in the first model were not the most influential covariates for both countries. In this second analysis, however, those ratios for GIRLS become the most influential covariates and are increased dramatically (see Table 10 and 11). This means that the desire for having a son in their third attempt is extremely high and strong. This also allows us a better understanding of why higher parities in China and South Korea show more imbalanced SRBs.

In the meantime, the ranking of the semi-standardized hazard ratios for the U. S. has no meaning because all but one of the coefficients are not significant (see Table 12). As I described in the earlier chapter, the U. S. does not have the son preference that China and South Korea have.

The Results of the Interaction Models

This dissertation also estimates the same kind of interaction models for each country as was done in the first group, with the same procedures and assumptions.

China and South Korea

In the second group for China (Table 13) and South Korea (Table 14), the coefficients for GIRLS are statistically significant and positive as in the first group. In addition, the hazard ratio for GIRLS in China is much stronger than that of the model without an interaction variable. Yet, the hazard ratio for GIRLS in South Korea is a little bit lower than the model without the interaction variable. Women who had only daughters as their previous children are 620 percent and 347 percent more likely to have a third child compared to women who had only two sons as their previous children for China and South Korea, respectively. Interestingly, the interaction variable does not support the hypotheses that women with more education who had two daughters as their previous children are less likely to have a third birth for both countries. The interaction variable (GIRLS-EDUCATION) does not have any statistical relationships with the hazard of having a third birth. Thus, we cannot say that women who already have two daughters with more education are less likely to have a third birth. Women's education does not influence on the decision of having a third birth.

Table 13. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, including the interaction variable, on the hazard of having a second birth: 6,882 married women, aged 15-45, with two live births (China, 1997)

	Hazard Coefficient		Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girls	1.97 *		4.53	7.20	2.28
Daughter-Son	-0.11		-0.41	0.89	0.95
Son-Daughter	-0.04		-0.12	0.96	0.98
Han	-0.43		-1.75	0.65	0.88
Age-Birth2	0.02		0.74	1.02	1.08
Policy2	1.01 *		5.33	2.76	1.57
Elementary	-0.88 *		-3.79	0.42	0.66
Junior	-1.05 **		-3.27	0.35	0.62
High	-2.02 **		-2.63	0.13	0.54
Girls- Education	-0.39		-1.75	0.68	0.63
Final log likelihood			-1000.4817		
Likelihood ratio χ^2			135.72*		

Note: * $p < .001$; ** $p < .01$

Table 14. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, including the interaction variable, on the hazard of having a second birth: 3,972 married women, aged 15-45, with two live births (South Korea, 2000)

	Hazard Coefficient		Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girls	1.50 *		5.90	4.47	1.93
Daughter-Son	0.16		1.00	1.17	1.07
Son-Daughter	0.48 **		3.19	1.61	1.22
Age-Birth2	-0.13 *		-10.09	0.88	0.66
Urban	-0.06		-0.67	0.95	0.98
Junior	-0.21		-1.59	0.81	0.92
High	-0.55 *		-3.90	0.58	0.76
College+	-0.57 ***		-2.59	0.57	0.80
Girls- Education	0.00		0.41	1.00	1.00
Final log likelihood	-4821.1787				
Likelihood ratio χ^2	505.78*				

Note: * $p < .001$; ** $p < .01$; *** $p < .05$

If we take into account the currently low TFRs for both countries (recall 1.6 for China and 1.2 for South Korea in the year of 2005), having a third birth is not common for the average women. Only 2 percent of women in the 1997 China Fertility Survey data had a third birth. For South Korea, only 19 percent of the women had a third birth. Due to the one child policy in China, a family with three children is rare. In addition, the costs of childrearing become increasingly expensive every year. This is mainly due to

the increasing cost of education (Kim et al. 2001). Considering this situation, having three children is not normal. Despite this situation, if women have a third baby, there should be a reason.

So, who wants to have three children? Women who want children of both sexes to have a balanced sex composition? It is a plausible explanation, but not likely to happen in China and South Korea. China has a one child policy; South Korea has only a TFR of 1.2 in 2005. If we consider current low fertility and childrearing costs for both countries, the decision to have three children is unlikely. Another possible explanation would be personal preference, that is, that women just prefer to have three children instead of one or two. This is possible, but there will not be many. Another possibility is unwanted pregnancies. This is also possible, but should not be many. Considering all the contraceptive methods and illegal abortions conducted in China and South Korea, the percentage of accidental third births should not be high. Therefore, the most likely possible explanation for having a third birth in these two countries is the desire for having a son in their family for lineage, their family name, their rituals for ancestors, and the support for aged parents.

In the situation of the third attempt, we could assume that decision of a third conception is not based on economic reasons, but rather on cultural reasons. As the prior studies indicate, imbalanced SRBs are larger in higher order births. Cultural norms and values are important decision making factors regarding fertility behavior in China and South Korea. This dissertation assumes that cultural reasons for having a son provide an important and powerful impetus to have a third birth over other factors. Other factors

such as women's status, for instance, or women's education level, do not seem to be as significant in decision-making process. In the circumstances of a third birth, pressures from family members including grandparents and other elder relatives would be too strong to resist or ignore, particularly considering Confucian culture where younger persons respect their elders (Hwang 1999). Thus, even women with higher education could not be free from the cultural norms and parents and husbands' strong will to have a son. This could be part of the reason why the hazard ratios for GIRLS in China and South Korea are extremely high, and SRBs in higher parities for both countries are more imbalanced. Furthermore, this could also be used to explain why son preference is not diminished by successful economic development and modernization in China and South Korea.

As a result, enhancing women's education has had an effect in reducing overall fertility, yet not son preference. With respect to son preference, economic development and modernization does not seem to have a major effect on son preference, particularly among the higher parities. That is why we need to stress that fertility decline is not a one dimensional phenomenon. We have to take into account not only the effect of economic development, but also the effects of culture and tradition, such as son preference, on fertility.

The United States

In the meantime, the U. S. interaction model repeats the same results as in the first group model (Table 16). The sample size in the interaction model is decreased from

2,180 to 558 (Table 15). The descriptive statistics for the interaction model are similar to the first group: relatively high percentage of having a third birth, a shorter duration from second birth to the third one, lower education level, and high percentage of poverty. Yet, the percentages of Hispanic women who had two daughters as their previous children and were in poverty were almost half lower than that of the first group; it decreased from 19% to 10%.

Table 15. Descriptive statistics for the interaction model: U. S., women who had two live births

The U. S. (2002)			
Total		558	Cases
Child2-3	(yes=1)	50.9	%
Duration2		63.4	min.:9; Max.:396
Sons	(yes=1)	25.6	%
Girls	(yes=1)	26.7	%
Daughter-Son	(yes=1)	22.0	%
Son-Daughter	(yes=1)	25.6	%
Urban	(yes=1)	93.5	%
Age-Birth2		24.8	Mean
Junior	(yes=1)	34.8	*
High	(yes=1)	36.0	%
College	(yes=1)	29.2	%
Poverty	(yes=1)	39.8	%
Girls-Poverty	(yes=1)	10.4	%

* Reference Group

The most important variable, the interaction variable, namely, GIRLS-POVERTY, is not significant. That means that a Hispanic woman who had two daughters as their previous children and was in poverty does not have any influence to have a third birth. As a result, my dissertation concludes that Hispanic American women are not particularly likely to have a third conception, in order to have a son.

Table 16. Cox proportional hazard model estimates of the effect of the presence of a daughter, and other covariates, including the interaction variable, on the hazard of having a second birth: 558 married women, aged 15-45, with two live births (The U. S., 2002) 558 married women, aged 15-45, with two live births (The U. S., 2002)

	Hazard Coefficient		Z-Score	Hazard Ratio	Semi-standardized Hazard Ratio
Girls	-0.16		-0.74	0.84	0.93
Daughter-Son	-0.34	***	-1.56	0.71	0.87
Son-Daughter	-0.43		-2.28	0.65	0.83
Age-Birth2	-0.06		-3.47	0.94	0.74
Urban	-0.32		-1.36	0.72	0.92
Junior	-0.06	**	-0.36	0.93	0.97
College+	-0.37		-1.99	0.69	0.84
Poverty	0.24		1.33	1.27	1.12
Girls-Poverty	-0.05		-0.17	0.95	0.98
Final log likelihood	-1681.7759				
Likelihood ratio χ^2	36.49*				

Note: * $p < .001$; ** $p < .01$; *** $p < .05$

This chapter has presented the descriptive statistics and the results of hazard analyses from the second group: women who had two live births. The results supported the hypotheses that Chinese and South Korean women were more likely to have a third birth if their first two children were daughters. In addition, the hazard ratios for having a third birth were much larger than those for the first group. The U. S. women were not likely to have a third birth, also as expected. With respect to the interaction models, the results for China and South Korea were interesting. The coefficients for the interaction variables for both countries were not significant. This means that women's education did not affect to reduce son preference in the case of the third birth. This also explained that the reason of why imbalanced SRBs became larger in the higher order births. The poor Hispanic women with two daughters as their previous children were not likely to have a third. Again, Unger and Molina's argument (1997) was not supported from my dissertation. The next chapter summarizes the results of hazard analyses and discusses the limitations and the implications of my dissertation.

CHAPTER VI

CONCLUSIONS AND IMPLICATIONS

The primary goal of the research conducted in this dissertation has been to examine the associations between son preference and fertility in China and South Korea, and to compare these with similar analyses in the U. S. The main question is whether the sex of the previous birth or births influence(s) another birth. My dissertation, however, is not only interested in the impact of son preference on fertility, but also on the impact of women's education on reducing son preference in China and South Korea. I am also interested in whether women of Hispanic origin in the U. S. with low socioeconomic status have increased son preference.

In summary, my dissertation provides general information on the cultural background, namely, Confucianism, in China and South Korea, which is helpful in understanding reasons for an existing strong son preference in both countries. This dissertation also reviewed prior studies on son preference and noted that only a few empirical studies had been conducted. The U. S. is analyzed as a contrast to the other two countries. Next, my dissertation outlined the empirical methodology that was used, namely, hazard analysis. Cox hazard analyses were undertaken using each country's fertility survey data. Finally, this dissertation also estimated a second hazard model including an interaction term to see the mediating impact of women's education on son

preference for China and South Korea. It also examined whether poor Hispanic women in the U. S. have increased son preference.

The Summary of the Findings

The most significant finding of this dissertation is that the sex of a previous child has strong and positive correlations with the hazard of having higher order births. Prior to the results of the hazard analyses, I presented descriptive analyses exploring the covariates among three countries.

With regard to the second birth, around two thirds of women who had one live birth had a second birth. In South Korea and the U. S., over 70 percent of the women had a second birth, while 62 percent of Chinese women had a second birth. The sex of the first child for the women in the three countries was seen as balanced; around half of the first births were daughters. An average risk period from the date of first birth for China and U. S. women was close to 60 months, while for South Korea women it was 10 months longer. South Korean women were older at their first birth and had a longer risk period compared to women in the other countries. Chinese women had the lowest educational attainment and American women had the highest educational attainment. The majority of South Korean and American women lived in urban areas. Over 90 percent of the Chinese women were Han and the majority of the U. S. women were

white. One quarter of the Chinese women had their second birth before the policy implementation.

With regard to the third birth, there were significant differences of having a third birth among women in the three countries compared to the findings regarding having the second birth. The percentage of having a third birth was significantly reduced. For instance, only 2 percent of Chinese women had a third birth, which is a large decrease from the 62 percent having a second birth. This was mainly due to the one child policy impact⁶. The percentage of having a third birth for South Korean women also dropped from 73 percent for the second birth to 19 percent for the third birth. Because South Korea does not have a compulsory family planning policy like China, the percentage of having a third birth was relatively high. However, only one out of five South Korean women had a third birth. The percentage of having a third birth for U. S. women was the highest among the three countries, at 45 percent. This high percentage makes sense if we take into account that U. S. family planning policy has no requirements regarding the number of children a family or woman may have; also the current TFR of the U. S. is around 2.1.

⁶ With regard to the policy impact, Min (2005) compared their impacts on fertility using 1988 and 1997 China data. The results showed that the policy impact was reduced. For example, the semi-standardized ratios showed that POLICY was more influential in 1988 than in 1997. After almost ten years of the one child policy, Chinese women were acclimated to it, and even younger women perceived low fertility as norm. In addition, recently the policy was loosened: some provinces now allow women to have a second birth if the first was a daughter (Greenhalgh and Li 1995). All these changes resulted in the policy impact being reduced.

The percentage of women who had two daughters was 22 percent for China, and 26 percent for South Korea and the U. S. An average risk period since the date of the second birth for China and the U. S. were 91 and 71 months, respectively. South Korean women had an average risk period of 49 months, which is two or three years less than for women in U. S. and China, respectively. Interestingly, if South Korean women decided to have a third birth, they had it after a relatively short period of time compared to women in the other two countries. One possible explanation for this is that since South Koreans marry later and have a second baby at older ages compared to women in the other two countries, they may be more likely to have a third birth sooner after the second birth. The percentages of other covariates were similar to the first group.

The differences in educational attainment in the three countries were obvious. This confirmed Croll's argument (2000) that economic development does not guarantee declining son preference.

Overall, the hazard models, including those with an interaction term, were shown to be significant. First, the impact of the sex of the previous child on the hazard of having a second birth for women who had one live birth was significant. In other words, women who had a daughter, instead of a son as their first child, had a higher hazard of having a second birth in China and South Korea as expected. The hazard ratios were significant and sizable. However, the hazard ratio for the U. S. was not significant and thus did not support the hypothesis. The U. S. has no or minimal son preference.

Most of the other covariates also supported the hypotheses. For Chinese women, older women, Han women, women who had children before the one child policy

implementation, and more educated women were less likely to experience the hazard of a second birth. For South Korean women, older women and women who live in urban area had lower hazard ratios of having a second child. However, with respect to women's education, the coefficients were positive and significant. This may mean that educated women had higher hazard ratios of having a second birth. Yet other scholars have found the opposite results for women's education among South Korean women. Taking into account South Korea's lowest low fertility, having two children is not common; thus, women who have enough resources for childrearing might decide to have a second birth.

Second, it is assumed that women who had two daughters instead of two sons would show higher hazard ratios of having a third birth. Given the low fertility situation and more imbalanced SRBs among higher parities in China and South Korea, the hazard ratios for the third birth should be stronger than those for the second birth. The results showed that the hazard ratios of having a third birth for Chinese and South Korean women were almost four and five times more likely to have a third birth, respectively. The hazard ratios for having a second child were around 30 percent. These results provide a clear explanation about the increasing imbalanced SRBs at higher parities for both countries. Human intervention such as sex-selective abortion may occur more often for the third birth than for the second birth. Thus, the conclusion to be drawn here is that son preference leads SRBs in the higher parities to be elevated. For instance, the SRB for the second parity in South Korea in 2000 was 107.4, and for the third parity was 143.9

(National Statistics Office, wwwsearch.nso.go.kr/search/search2/common/SearchLink.jsp)⁷.

The results for the U. S. continued not to support the hypothesis of son preference. While some Americans might have son preference, this may be more likely to occur among small populations such as Chinese Americans, Korean Americans, and Vietnamese Americans. Mostly sex preference for Americans is related to the desire for a balanced sex composition of children. Thus, sex preference in general will not lead to the balanced SRBs. The covariates in the second group were consistent with expectations. Women's education for South Korea was also negative and significant which was expected. Women with more education were less likely to have a third birth.

Third, this dissertation introduced an interaction effect between the sex of the child and women's education in China and South Korea.

Scholars (Greenhalgh 1985; Croll 2000; Min 2004) have argued that son preference is related to gender inequality: if the society has high gender inequality, son preference will be strong and salient; if the society has a more egalitarian gender relationship, son preference would be low. Women's education was used as women's social status in this dissertation. More educated women showed a lower likelihood of having another birth. Education level suggests that women have modernized values, in

⁷ The SRBs by parity have also narrowed. For instance, the SRB of the first parity in 1988 was 107 (Choe, Kim, and Lee 1993), but decreased to 105.2 in 2004 (National Statistics Office, wwwsearch.nso.go.kr/search/search2/common/SearchLink.jsp). For the second parity it was 113.5 in 1988 and 106.2 in 2004, respectively. For the third parity it was 170.5 in 1988 and 132.7 in 2004, respectively. Accordingly, the imbalanced SRBs have declined slightly even at higher parity.

particular, low fertility norms and less son preference. Thus, my dissertation assumed if this argument was true, women's education should have a mediating impact between the sex of the previous child and another birth, in a negative way. Women with more education who had a daughter(s) as their previous child(ren) would be less likely to have another birth. The results showed partial support for the hypothesis. In the first group, more educated women who had a daughter instead a son as their first child were not more likely to have a second birth, as the hypothesis expected. The hazard ratios also were significant and substantial. In the second group, however, more educated women who had daughters instead of sons as their first two children were not shown to be more likely to experience the hazard of having a third child. This means women's education apparently does not reduce son preference in the case of the third birth. Given the low fertility situation in both China and South Korea, if women want to have a third child, there should be a reason, namely, strong son preference. Thus, women's education apparently has limited or no influence on the childbearing decision where son preference is strong. The strong emphasis on having a son in the family from grandparents and/or a husband cannot be ignored easily and appears to outweigh women's education. This suggests why imbalanced SRBs in China and South Korea are still prevalent despite increasing women's education, and why SRBs became more imbalanced at the higher parities. Perhaps, women with two daughters wanted to make sure the third birth was a son.

Fourth, the hazard models were estimated that included an interaction variable for U. S. poor Hispanic women. Unger and Molina (1997) argued that poor Hispanic

women with a daughter or daughters were more likely to have another birth in order to be able to have a son. However, their study was conducted in a limited area and the sample size was small; thus, it was not generalizable. Therefore, my dissertation tried to examine if this argument holds with nationally representative sample. To do so, I first restricted the data only to Hispanic women. I then, constructed an interaction variable between the sex of the child and poverty. If the above argument holds, the interaction variable should be significant and positive. The results for both first and second group, however, did not support the argument. Hispanic women with low socioeconomic status did not have a statistically significant hazard ratio of having a higher order birth. Accordingly, even though some Americans might have son preference, there is no statistical evidence of American son preference at the national level.

Conclusions and Implications

As Poston has argued (2002a), the fertility transition in China and South Korea is not a single dimension process focusing only on changes in fertility, but rather should be regarded as an integral component of the overall transition of the society from a traditional form to a modern one. We need to take into account not only the level of fertility, but also the timing of childbearing and the sex composition of the children. When fertility declines rapidly with regard to the number of children a couple may have, the tradition of strong son preference will become more obvious. This may be shown in

the patterns and trends of abnormally high SRBs observed in both China and South Korea.

Before concluding my research, it should be noted that there are several limitations and implications. First, the 1997 China Fertility Survey and the 2000 South Korea Fertility Survey do not have enough information on women's status. Thus, the hazard models could not include other important variables such as women's occupation, residence, and income.

Second, as described in the literature review, son preference has both economic and cultural reasons. However, the data were not particularly designed to address those kinds of questions and variables. For instance, the survey did not ask the respondents about how they supported their parents and about the cultural pressures on their fertility behaviors and decisions. The literature reported that the pressure from family members to have a son has a fairly large influence; however, there was no variable directly reflecting this aspect. Thus, the results of this dissertation leave more questions to be investigated and answered. More information regarding the direct cultural impacts on fertility needs to be obtained.

Third, the hazard model including an interaction variable in the U. S. only used poverty as an index of low socioeconomic status. Thus, a number of problems remained that need to be explored. For instance, with respect to Hispanics, more questions dealing with socioeconomic status and acculturation are needed.

My dissertation on son preference and fertility can be extended in several ways. This dissertation clearly shows the impact of sex of the previous child on the hazard of

higher order births. However, with respect to gender inequality and son preference, this dissertation found only partial support. Women's education had a mediating impact reducing son preference in the first group, but not in the second group. This finding supports the notion of more imbalanced SRBs in higher parities in both countries, but suggests that other variables regarding women's status are needed in the model. By focusing on gender inequality, we can obtain a more detailed relationship between gender and son preference. In addition, because the gender relationship is becoming more equitable and favorable for women⁸, using more recent fertility survey data will provide a more accurate examination of the influence of gender equality on son preference. Moreover, we can combine different datasets regarding fertility and gender

⁸ Given the lowest low fertility situation in China and South Korea, we can expect that fertility rates for both countries will remain low and not increase rapidly in the near future. How about son preference? Will son preference continue to remain strong or will it decline? This is hard to answer, but we can consider several situations. First, young couples do not want to have two or more children, and this leads to lowest low fertility. Even the number of childless couples is increasing. Second, childcare is becoming more problematic because, more and more, both members of the couples work and the balance between work and family is not easy. Also, the cost of childcare is increasingly expensive every year. Average household incomes do not permit quality education for two children. Grandparents spend less time taking care of grandchildren; instead they are enjoying their late lives. Third, traditions and norms are changing at a fast pace in both countries. For example, one study reported that the proportion of families with daughters caring for the parents was increasing slowly (Kim et al. 2001). Young couples are paying less attention to traditional values such as family lineage and rituals. Along with these social changes, women are gaining access to more power: more women work, women's power in the domestic area is increasing, and more women have more say on their reproductive decisions. Even though gender inequality is not easy to reduce in those countries, these social changes suggest less or no son preference. Thus, we need to examine why son preference continues among the young couples. Better and more complete data are needed.

inequality, which would allow us to use more advanced statistical models such as a multilevel analysis.

Second, this study can be further extended to other racial and ethnic minorities in the U. S. The population size of minority groups in the U. S. is growing, and their subcultures are becoming more salient. Thus, the following question regarding fertility can be raised. Do minorities from countries with son preference, such as China, South Korea, Taiwan, Vietnam, and India carry their cultural traditions to the U. S.? If they assimilate to the current dominant culture in the U. S., they should show no or minimal son preference. So for them son preference would not influence them to have another birth. But if they retain their cultural norms from their home country, they would be more likely to have another birth to have a son. Thus, it would be meaningful to explore how cultural heritage, such as son preference, affects the fertility patterns and attitudes of reproductive behavior among U. S. minorities from such countries.

Third, this study can be extended to other Asian countries such as India, Taiwan, Vietnam, Bangladesh, Pakistan, and so on. Examining the impact of son preference on fertility for women from those countries would enhance the results of this dissertation. We could observe the impact of son preference in different social situations. For instance, all the above countries demonstrating son preference have different levels of economic development and women's status. Thus, it would be worth studying the impact of development, modernization, and gender inequality on son preference among these nations. Much more research on this very interesting topic needs to be undertaken.

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VITA

Ho Sik Min

Center on the Family, University of Hawaii at Manoa
2515 Campus Road Miller Hall 103, Honolulu, HI 96822
Hosik@hawaii.edu

EDUCATION

May 2007	Texas A&M University	Sociology	<i>Ph.D.</i>
August 1998	Korea University	Sociology	<i>M.A.</i>
February 1993	Korea University	Sociology	<i>B.A.</i>

AREAS OF INTEREST

Social Demography; Fertility; Mortality; Applied Demography; China; South Korea; and Asian American Studies.

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Poston Jr., D.L., H.S. Min, J.W. Yoon, and B. Gu, 2004. "The Impacts of the Fertility Transitions of South Korea, Seoul, Pusan, and Daegu on the Elderly Population." *The Journal of Gerontology* 8: 167-201.

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